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TOTAL ADRENALECTOMY FOR MALIGNANT HYPERTENSION

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RECENTLY there has been an interest in this country in performing bilateral total adrenalectomy for patients in the preuremic phase of malignant hypertension. There are obvious reasons why the adrenal glands have been chosen as a point of attack to interrupt the vicious cycle of this malignant variant of diastolic hypertension. Almost without exception, patients chosen for this procedure have fallen into the group rejected for sympathectomy (Smithwick groups IV and V).[1] Green and others[2] have reported the details of bilateral adrenalectomy done for a single patient with diabetes and malignant hypertension. Zintel and associates[3] mention the performance of total adrenalectomy in 2 patients. Thorne has been cited as having had experience with 12 such patients.[4] It is the purpose of this report to record our experiences with a patient surviving five months after total bilateral adrenalectomy done in one stage for severe malignant hypertension.

CASE REPORT

The patient, a 48 year old white man, was referred to our hospital in August 1951. Seventeen years previously, in 1935, he first developed pyelonephritis and passed many urinary calculi. Fluctuating hypertension appeared in 1947 and was refractory to medical therapy. Three months prior to entry the pressure rose suddenly from an average of 168/108 to 210/130. Albuminuria and

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visual difficulty were noted. Shortly thereafter he developed a sudden left hemiplegia, inability to void, incapacitating headache and persistent nausea with frequent vomiting. He was bedridden at the time of admission with an average blood pressure, after sedation, of 210/130-140. There were grade IV changes in the eyegrounds. The urine was neutral with albumin 1 plus and a maximum specific gravity of 1.017 on concentration test. The phenolsulfonphthalein test excretion was 50 per cent in two hours, and the blood urea nitrogen was 11 mg. per 100 cc. The electrocardiogram suggested left ventricular predominance but was within the limits of a normal tracing.

On a program of salt restriction and sedation, the patient's general condition deteriorated steadily and hope for his immediate survival was abandoned. The limited life expectancy led to a decision to perform a bilateral adrenalectomy in one stage. This was accomplished without difficulty and support of the adrenal cortical insufficiency was not too difficult. He was fairly well stabilized by the fifth postoperative day with a blood pressure of 170-190/120-140, a range characteristic of his entire subsequent course.

Three weeks after operation, the patient was symptomatically improved. The headaches were almost completely relieved, there was a considerable return of vision and the patient began to get out of bed. About this time there first appeared an episode of nausea, vomiting and circulatory failure requiring an increase in the daily dosage of desoxycorticosterone acetate (D.O.C.A.). From this time on there was constant difficulty in this regulation and a narrowing zone of balance between too little D.O.C.A. and too much D.O.C.A. On a low D.O.C.A. intake there was sodium excretion, weight loss and hemoconcentration suggestive of reduction in extracellular fluid and plasma volumes. Headache usually initiated the onset of this syndrome. Pulsus alternans was always a prominent feature as the extracellular deficit became manifest. At these times, the patient developed angina pectoris and exhibited an intolerance for digitalis. Terminally, the angina pectoris was followed rapidly by shock requiring intravenous infusion of plasma for resuscitation. Attempts to increase the D.O.C.A. intake were followed by salt retention, weight gain and hemodilution. At these times, the patient developed increased hypertension, and gallop rhythm progressing ultimately to pulmonary edema and left heart failure. Digitalis was definitely beneficial during these episodes, but it was necessary to use short-acting glucosides in anticipation of the syndrome known to follow the indicated reduction in dosage of D.O.C.A. During the last few weeks of life, it was apparent that a daily intake of 2 mg. of D.O.C.A., together with 50 mg. of cortisone, was insufficient to prevent angina pectoris and oligemic failure; whereas 3 mgm. DOCA per day was soon followed by hypervolemia and left heart failure. Such precarious balance was impossible to maintain and the patient succumbed approximately five months after operation.

Discussion

It has been of some interest to speculate as to whether increasing coronary insufficiency was responsible for the terminally precarious balance in our patient, or whether the combination of D.O.C.A. and cortisone were inadequate to support circulatory efficiency. The regression of vascular changes in the eyegrounds and the relief of headaches were the most striking features of such benefit as may have followed the operation. This evidence of subsidence of vascu-

lar damage has led us to believe that we may not as yet have adequate replacement therapy to justify total adrenalectomy for malignant hypertension. At the Lahey Clinic, 6 patients with severe hypertension survived total adrenalectomy an average of three months.[5] From our own experience, it would appear that after total adrenalectomy the available adrenocortical hormone necessary for survival is not too different in amount from that required to maintain hypertension. We have given up, certainly for the immediate future, any extension of these clinical investigations of total adrenalectomy in malignant hypertension. It is only fair to point out, however, that these conclusions do not necessarily apply to subtotal adrenalectomy.

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THE PROBLEM OF HERNIORRHAPHY: INGUINAL AND INCISIONAL

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THE high recurrence rate after hernia repair prompted this study and the production of this paper.

A study of the literature indicates a national rate of 12 per cent recurrence following repair of indirect hernias and 18 per cent recurrence following direct hernias. This rate should not be over 1 to 2 per cent to be satisfactory. Apparently 80 per cent of the recurrences occur within the year of repair. Certainly a surgical procedure with this poor record justifies investigation.

The multiplicity of types of repair and the equally numerous writings on the subject indicate that no fully satisfactory technic has yet been perfected.

The repair of hernias carries a low mortality and relatively low morbidity so that many men who practice surgery do them when they would not embark upon a procedure which presumably would require more careful technic and training. There is a general impression that "anyone can do a hernia." Certainly some of the attempts to cure one of the oldest afflictions of mankind are primitive. Those of us engaged in resident training programs in surgery have contributed in part to this high percentage of recurrence by classifying herniorrhaphy as a simple surgical procedure and one which can be entrusted to trainees young in surgery. Actually a proper hernia repair requires a thorough anatomical knowledge of the region, careful handling of the tissues and good surgical technic.

Anatomical studies conducted under auspices of the Kansas City Anatomical Society confirm the fact that the internal ring is more properly a sling composed of fibers of the transversalis fascia. The ends of these fibers are attached to fibers of the transversalis muscle which, on tensing the abdominal musculature, pull the cord and ring up under the conjoined muscle edge. This has been well described by W. J. Lytle[1] of Sheffield, England. This sling or ring is stretched to a greater or less degree in each indirect hernia and must be repaired from below the cord to give adequate sheltering "shutter" action. The transversalis fascia has varying thickness in the floor of Hesselbach's triangle, but is usually an easily identifiable and useful structure. Certainly, if it is properly repaired and holds, no indirect or direct hernia will recur.

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Polya[2] in 1906 noted that in 46 per cent of the dissected cadavers the internal oblique muscles inserted high on the lateral rectus border, probably due to a defect of formation of the lower fibers of the internal oblique. Our contribution to repair of this defect lies in shortening the lateral border of the rectus sheath by excising a triangular wedge of the rectus sheath with its base at the lateral edge. The base is the length of rectus sheath above the pubes into which no internal oblique muscle is inserted. This wedge excision is then closed by interrupted wire sutures, thus bringing the lower border of the internal oblique and conjoined muscle to the inguinal ligament. This maneuver narrows Hesselbach's triangle and covers the transversalis fascia by shortening the rectus sheath; all tension is relieved and the "weak spot" reinforced. No fascial strips or transplants are necessary in this repair. This one maneuver which, in shortening the lower rectus sheath, brings down the internal oblique muscle and narrows Hesselbach's triangle, furnishes sufficient tissue to complete the repair (fig. 1, inguinal hernias).

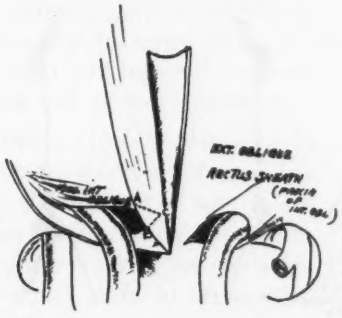

Fig. 1. Repair of inguinal hernias. Sketch showing location of excision of rectus sheath.

In figure 1 you might say we pull down the man's vest to close the gap. Suture of tissues other than the transversalis fascia to Cooper's ligament, as has been advocated in recent years, distorts the tissues of the abdominal wall and, in my opinion, is of value only in repair of femoral hernias.

Shortening of the rectus sheath is the same principle I have used for years in repairing defects of large incisional hernias of the abdominal wall. Shortening of the rectus sheath immediately narrows the defect and allows closure with no tension. Shortening the sheath on one side at the upper end, and on the other side at the lower end, increases the security of the closure. This procedure may

be used to close both the posterior and anterior sheaths if necessary (figs. 2, a,b,c,d, incisional hernias).

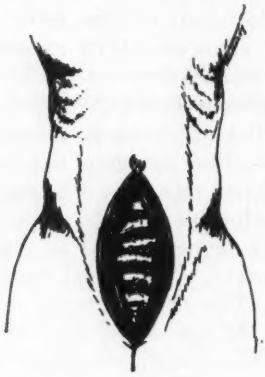

Fig. 2a

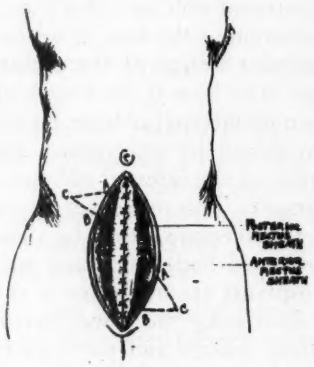

Fig. 2b

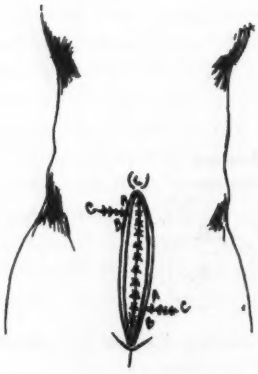

Fig. 2c

Fig. 2d

Fig. 2. Repair of incisional hernias. Steps in the repair of incisional hernias (a,b,c,d), showing the method of narrowing and shortening the defect by excision of wedge shaped portions of the fascial edges.

The common errors in repair of inguinal hernias are listed below, some of which are elementary but are too often ignored:

1. Poor selection and preparation of cases for operation. Patients who have impairments which cause them to strain at cough, defecation, or urination should have the causes of these impairments improved or cured before being accepted for surgery. Metabolic diseases with obesity, diabetes, fluid retention in tissues or hypoproteinemia should be corrected.

2. Incomplete dissection of the sac. The sac should be removed from the cord with little trauma to the cord. The sac of indirect inguinal hernia should be first identified at the internal ring where it always lies cephaled to the vas deferens. The sac should be opened early in the procedure, and the contents identified and reduced and the area explored for adherent abdominal viscera, sliding hernia, and the probable direct sac, and possible femoral sac. Dissection of the sac should be carried beneath the deep epigastric vessels to the dense prevesical fat until the musculature of the bladder wall is exposed. Complete closure under vision can be obtained with an internal purse string suture, and then ligating outside, before excision of the surplus sac. The neck of the sac should not be fixed to the under surface of the conjoined muscle. The protective sliding action of these tissues has been described earlier in the paper.

3. Failure to remove the direct sac and to repair properly Hesselbach's triangle causes direct recurrence. This is the "weak spot" in the lower abdominal wall. The transversalis fascia must first be repaired, including suture to make a "snug" sling as above stated, then supported by overlying muscles and fascia of the transversalis and obliques by shortening the rectus sheath if necessary. Certainly if the transversalis layer and internal ring are repaired, and never again breeched, there will be no recurrence.

4. Failure to maintain accurate planes of dissection and careless control of bleeding points leaves a wet wound and consequently poor healing and possible dehischence of suture lines. Mass ligature of large amounts of tissue and bruising of tissue from many hemostats, or rough handling, result in serum accumulation. In this connection, we should mention suture material because its type and size influence the amount of secondary tissue reaction. We recommend the use of cotton and wire because of the small amount of foreign body reaction created and consequent earlier and stronger fibroplasia. At present our patients are out of bed on the day of operation if they desire. They are taught and urged to practice tension of the abdominal musculature by "sucking in" and "standing tall" from the first day.

Conclusions

An old idea is restated, that of the shutter action of the internal ring or sling in inguinal hernia.

A new and simple procedure to reinforce the weak lower abdominal wall triangle of Hesselbach by shortening the anterior sheath of the rectus is stated.

A reevaluation of the problem of surgical repair of incisional hernia by a similar shortening of the rectus sheath is presented.

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THE TREATMENT OF FACIAL SCARS

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FACIAL scars and blemishes are a constant source of annoyance and embarrassment to children and adults alike. The doctor who underestimates the psychological effects of scars does the patient a grave injustice. Facial scars may be of importance, not only because of the possibility of an inferiority complex, but because they may be an actual economic and business handicap. Rare indeed is the man who can turn such a handicap to his advantage.

The most common facial scars are a result of automobile accidents, and due cognizance has been given this problem by some recent automobile designers in their new models. There are fewer prominent knobs and projections present for one to be thrown against in sudden stops and crashes. Indeed one car manufacturer has a built-in crash pad and other designers show promise of following suit. There are also very effective crash pads available as additions to cover the hard instrument panel.

Of course, the best time to see a facial injury is immediately after that injury, for careful approximation after adequate débridement and cleansing is the key to a well healed wound. (Fig. 1 a & b). Fine suture materials which are removed at the earliest practical date add to the possibility of a good result. Incisions which cross the lines of cleavage of the skin, or of Langer's natural lines of the facial skin naturally will heal with somewhat more of a scar than those which follow these natural lines or creases. However, even these can be repaired so as to leave a fine line and a very insignificant scar.

Scars resulting from automobile accidents, as from other injuries, should probably not be excised and reclosed for a period of at least six weeks and preferably 10 weeks following the accident. In infected cases, of course, the wait should be much longer. Surgery is nearly always carried out under local anesthesia, for block of the sensory nerves of the face is very satisfactory (figure 2 a & b). The surgical excision is carefully planned beforehand so that the surgeon knows at the time of the surgery exactly what he intends to do. Excision is carried out beyond the edges of the scar tissue so that soft, pliable, healthy tissue is closed, avoiding the incorporation of any scar tissue in the closure which will delay healing and give a less satisfactory result (fig. 3 a & b). The incisions which

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Fig. 1a. Deep oblique laceration of forehead seen immediately following an automobile accident.

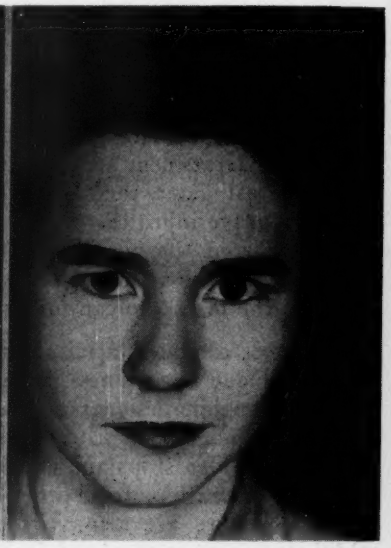

Fig. 1b. Five months following repair by débridement, thorough cleansing, and closure.

Fig 2a. Two months following automobile accident with laceration-avulsion of cheek.

Fig. 2b. Three months following surgical excision and repair of scar as described.

encompass the scar are usually made either vertically through the skin or beveled away from the scar so as to excise somewhat wider the subcutaneous tissue and dermis than the outer layers of the

Fig. 3a. Multiple scars of face caused by shattered windshield.

Fig. 3b. Early postoperative result following excision of the larger scars and abrasion of the smaller ones.

skin. Adequate undercutting is then carried out and the subcutaneous tissue immediately beneath each of the two ends of the wound is excised in a small wedge-shaped section. This is to allow for flattening in these areas and avoid the puckering and fullness which sometimes occur at the two ends of such an incision (fig. 4 a & b). If real puckering does occur, then of course, a small triangular section of skin should be excised so as to refit the ends of the incision. All such tailoring incisions should be made parallel to the lines of the skin as much as possible. An incision should be made to curve over flexion creases rather than to be made as a straight line which may later contract. Contracted scars which cannot be corrected by excision and reclosure can be corrected by interpolated flaps, Z-Plastics, or by skin grafts (fig. 5 a & b).

The reclosure of the wound is accomplished by fine sutures which secure the dermis and subcutaneous tissue and relieve the tension from the epidermis. Then either a running intracuticular suture, or multiple fine sutures secure the epidermis. A pressure dressing is then in order.

After excision and reclosure of scars the suture line should be

Fig. 4a. Wide scar with loss of subcutaneous tissue and a part of the mandible resulting from an explosion. The mouth is deformed and contracted on the right side.

Fig. 4b. Early result following excision of the scar tissue and advancement of the skin and soft tissue of the neck to fill the defect. A rotation flap of mucosa corrected the contracture inside the mouth.

Fig. 5a. Contracted scar of nose causing deformity of ala.

Fig. 5b. Following advancement of ala and full thickness skin graft.

Fig. 6a. Cinder marks (Traumatic tattoos) resulting from accident several months previously.

Fig. 6b. Immediate result following abrasion of scars in one stage.

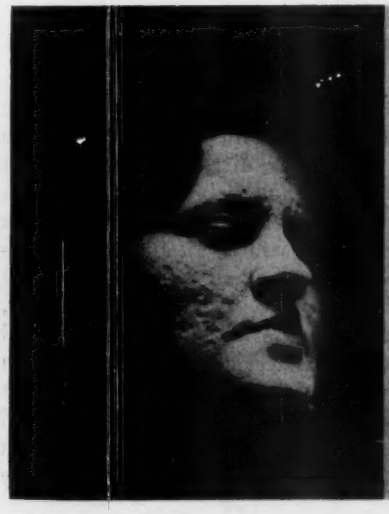

Fig. 7a. Multiple facial scars from chicken pox and acne.

Fig. 7b. Following surgical abrasion under local anesthesia in stages.

protected from stretching and manipulation for a period of about four to six weeks. This time is necessary for the collagenous fibers in the dermis to obtain enough strength to prevent widening of the scar. Support is usually in the form of butterfly adhesive strips or as a thin collodian dressing applied after the sutures are removed.

Fig. 8a. Pitted scars following acne.

Fig. 8b. Result achieved by surgical abrasion (the sandpaper treatment).

A not too uncommon type of scar found about the face is the cinder mark (fig. 6 a& b). These are also called traumatic tattoos due to the grinding into the skin of cinders, dirt, and other foreign material in accidents of all kinds. Oil and debris may be blown into the skin in explosions in a similar fashion. If these patients are seen immediately after the injury, of course an adequate scrub-up with a brush and copious amounts of soap and water will prevent a large part of this material from being left in the skin. However, the surgeon may first see the patient many weeks after the initial accident and at this time the foreign material is incorporated in the skin. The proper treatment at this time is the surgical abrasion of the facial skin in one or more stages. Usually one stage is all that is required and this is carried out as for the surgical abrasion for acne scars and pitted scars of other types. The results are very gratifying.

Scars due to smallpox, chickenpox, acne and other localized skin infections are a source of great annoyance to the patient. These

scars are usually pitted scars and cast a shadow when the light strikes the facial skin from any direction other than straight on (fig. 7a & b). It has been a policy of plastic surgeons in the past few years to treat these scars only after complete quiescence of the acne infection in the acne cases. Though the dermatologist should see the acutely active cases, it has been found that moderate activity

Fig. 9a. Scar of cheek and scar of forehead. Scars are somewhat depressed and cause slight deformity of lip.

Fig. 9b. Three months following surgical abrasion of scars.

of the acne is no contraindication to beginning surgical treatment of these scars. Abrasion is carried out under local anesthesia and may be carried out with the patient hospitalized or as an out-patient, as desired. There is minimal postoperative discomfort and the chance of further scarring by this method of care is practically nil (fig. 8 a & b).

Abrasion brings about improvement in traumatic scars in two ways. It helps to blend in the fine line scar, and it smoothes out any irregularities in the surface of the scar, thereby preventing any shadow (fig. 9 a & b).

By way of summary, one might answer these expected questions concerning scars. The best time for surgery is after softening of the tissues, and in children should be carried out before fixation complexes occur. The surgery is as safe as the anesthetic and local

anesthesia can usually be used. The true keloid former occasionally is encountered and roentgen ray therapy is of benefit postoperatively. ACTH, Cortisone, and Kutapressin are under investigation in this regard.

In general, a great improvement is to be expected from the treatment of unsightly scars, and anyone so handicapped should be educated to this possibility.

THE USE OF MORE POTENT COBRA VENOM FOR INTRACTABLE PAIN

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THE NEED for an analgesic agent that is potent, relatively non-toxic, and not habit-forming is too real to require comment. It seems clear that cobra venom if properly administered fulfills these requirements in a high percentage of patients. The failure of this drug to have been widely accepted in the past has been due to: (1) inadequate dosage, (2) the presence of a hemolytic factor, (3) the failure to recognize the latent period.

There are many articles in the medical literature, particularly from France, describing the therapeutic use of cobra venom. Most of this information was obtained by the use of small quantities of unpurified venom. In 1938 Macht in this country attempted to purify and to standardize the dosage of this material. He pointed out a fundamental difference between cobra venom and morphine, namely, that the analgesic effect of the latter is prompt and of short duration, whereas the analgesic effect of cobra venom is only obtained after many repeated injections. It is important to emphasize two other basic differences which exist between these two drugs. The morphine alkaloids evoke tolerance which necessitates a steady increase in dosage. On the other hand, effective levels of cobra venom, once secured, can be maintained with minimal quantities of the drug. The second difference is that morphine leads to addiction, but no one has ever observed a patient addicted to cobra venom.

Dosage. Macht used mice for the standardization of the dosage of cobra venom. He assumed that the lethality of the compound for mice was synonymous with its potency as an analgesic. This may or may not be true. As a result of his work sterile solutions of cobra venom have been accepted by the National Institute of Health. These solutions are marketed in ampules containing 10 mouse units per cc. A mouse unit has been defined as that quantity of venom which will kill a 20 gram mouse in twenty-four hours. Recent studies have brought about improvements in the purification of cobra venom. A method for the removal of most of the hemorrhagic factor, and at the same time recovery of larger quantities of the analgesic factor, was worked out. As a result of some of these studies a preparation with 50 mouse units per cc. containing very little of the hemorrhagic factor is now available for clinical use. (Hynson, Westcott & Dunning, Inc., Baltimore, Maryland.)

Toxicity. Little is known as to the exact mechanism of death from cobra venom. Professor J. C. Krantz, at the University of Maryland Medical School, made recordings for us of the changes in blood pressure and respiration of dogs following the intravenous injection of the toxin. The material used contained 166 mouse units per cc. He found a pronounced depressor response. Respiratory failure appeared to be the cause of death. In subacute toxicity studies on rats the same observer gave 2 mouse units of cobra venom intraperitoneally each day for 21 days. No demonstrable effects on the blood elements or blood chemistry were produced. There were no histologic changes detected in the livers, kidneys, brains, or pituitary glands.

Clinical Experience. During the past five years the authors have been using cobra venom for the control of pain, particularly in patients with inoperable malignancy. Following the diagnosis of carcinoma, medication such as aspirin and phenobarbital is used. When pain reaches the point requiring the use of codeine, cobra venom is started. This allows for the primary period of 14 to 20 days (or even 30 days) which is necessary to reach the full analgesic effect of the drug. We have treated 30 cases, including 3 patients with severe migraine headaches, in which the results have been gratifying. From this experience the following impressions have developed: 1. It is quite safe to give 50 mouse units of cobra venom subcutaneously twice a day for an indefinite period. 2. The drug has a cumulative action. Little or no benefit is derived from the initial injections. Ordinarily the maximum effect is not obtained until the second or even the fourth week of treatment. 3. After the maximum effect has been secured the dosage can be reduced to one injection every other day or every third day. 4. Specific antitoxin is developed following the administration of this substance. 5. When given in excessive quantities (1800 mouse units in three days) the patients develop transient diplopia and hemiplegia. 6. The drug may be entirely ineffective for some patients at the dosage level outlined above, and occasionally causes severe vomiting.

A summary of the treatment given 6 patients illustrates all of these six points except the last.

Case Reports

Case 1. Mrs. C. W. H. (age 87) has been treated in her home from July 1947, to the present time for incapacitating pain due to hypertrophic arthritis of the spine. She was given 10 units of cobra venom every day for 40 days and was greatly relieved. Then 10 mouse units every third day sufficed to keep her comfortable. After four years, ampules of sterile saline were substituted for those containing cobra venom. Within six weeks her pain recurred and

increased in severity. Cobra venom was then resumed on the dosage schedule of 20 mouse units every day. After four weeks her pain was greatly reduced and at present she is on an injection of 50 units three times a month. An assay of her blood showed antitoxin of sufficient strength for 1 c.c. of serum to protect a mouse against 10 lethal doses of toxin. Neurological examination showed no impairment of the sensory modalities.

CASE 2. Major F. A. P. (age 40) an aviator admitted to the Johns Hopkins Hospital on Oct. 16, 1949, and discharged on Nov. 15, was found to have a rapidly growing chorio-epithelioma. Following an exploratory laparotomy on Oct. 30, 1949, which showed extensive metastases, the patient's pain increased so that the morphine requirement within 12 days went from 8 mg. twice a day to 32 mg. every two hours. Cobra venom was given (1 cc. twice a day) and rapidly increased to 12 cc. (120 mouse units) a day. The patient was sent home on this dosage. Three weeks later he was relatively free from pain. The morphine requirement was reduced to 8 mg. in 24 hours. The patient died suddenly two months later, presumably from a hemorrhage.

CASE 3. Mr. J. D. (age 70) entered the Union Memorial Hospital on Nov. 6, 1950, for an amputation of the leg because of arteriosclerotic gangrene. Following the operation he had very severe pain in the phantom foot. For two months he received morphine and demerol regularly without any improvement in the pain. Cobra venom in a dosage of 50 mouse units daily was given for three weeks. By the twentieth day the morphine had been entirely eliminated. The cobra venom was diminished to 50 mouse units twice a week and this has sufficed to control his pain.

CASE 4. Mrs. W. L. (age 53) of Middletown, New York. This case was submitted by Dr. Alexander Preston. On Aug. 26, 1949, the patient had a right radical mastectomy performed for canalicular carcinoma and was well until January 1951, when she was admitted to the Middletown Hospital because of pain in the right lumbar and right hip area of six weeks' duration. The patient was given deep roentgenotherapy in this region for bony metastases. In June 1951, the patient had metastases in the third lumbar vertebra and decalcification of the right femur in the upper third. Testosterone was administered. In October 1951, pain in the right shoulder, knee, and hip was very marked and procaine infusion failed to give any relief. Cobra venom, 10 units a day, was started on October 16 and was carried through to November 2 without any objective effect on the generalized pain. On November 4 the dose was raised to 50 units and this was continued daily until November 18. On November 9 a pathologic fracture of the right femur was discovered which was treated with traction. Roentgenogram revealed metastatic disease at the site of the fracture. On December 9 bony destruction was found in the occipital area on both sides. Cobra venom was continued every other day from November 18 until December 9. On December 21 diffuse pulmonary metastases and multiple rib metastases were noted.

By November 9 the patient was a great deal more comfortable. Narcotics were reduced to two doses a day and only one dose was given at night. She was discharged January 14 and given 50 units of cobra venom twice a week thereafter. The patient gradually went downhill, but required no more medication for pain until the day she died, Feb. 7, 1952.

CASE 5. Mrs. W. E. (age 59) a nurse, was admitted Sept. 18, 1951, ex-

plored on September 20 and found to have carcinoma of the pancreas with extension and metastases. A cholecystojejunostomy was done as well as an entero-enterostomy, gastroduodenostomy and a vagotomy. The patient made a fairly uneventful recovery from this operation but required pantopon (21 mg.) approximately every four hours. On October 1 cobra venom, 100 units twice a day, was started. On October 11 the patient had recovered sufficiently to walk around, but developed rather marked weakness in her legs. The venom was discontinued for two days and her strength returned. She was then given 100 units a day. On discharge she required only 2 injections of pantopon a day. At home she received 50 units of cobra venom twice a day until the day before she died. The intractable pain primarily in the left upper quadrant and in her back, which had been present since June, gradually cleared up. She was able to do her sewing and some light dusting around the apartment. She ate moderately well and apparently lost little weight. Jaundice occurred about November 1. The course was slowly downhill as far as strength was concerned. The patient finally went to bed on November 14 and went into a shock-like state with a blood pressure below 50. She then gradually went into a coma and died on November 15.

CASE 6. Mr. F. C. (age 61) entered the Johns Hopkins Hospital on Jan. 29, 1952, and was discharged on Feb. 9, 1952. He had been suffering from intractable pain of the upper abdomen and of the posterior midthoracic region for the past year, and also from watery bowel movements. At operation the patient was found to have a retroperitoneal lymphosarcoma with metastases to the back. He was started on cobra venom, while at the same time he was receiving aspirin, phenacetin and codeine tablets. He made an uneventful recovery from the operation and returned home to Florida. There his weight went from 108 pounds to 119 by March 15, 1952. He has been able to go sail-fishing and swimming every day. He continues to have pain in the back, though it is fairly well controlled with aspirin and phenacetin (AP) without codeine. He has continued to receive 50 units of cobra venom a day.

SUMMARY

It seems clear that cobra venom can be safely used as an analgesic agent in far larger doses than was formerly believed. It should be particularly helpful in those patients who otherwise would require morphine for long periods of time. We do not know the site of action of cobra venom but believe that it is somewhere in the autonomic mechanism. Touch, pain and temperature sense are not affected in the doses we are using, so the somatic system seems not to be affected. From our experience, we believe that cobra venom merits a much broader clinical trial and that one should continue treatment up to 30 days before stating that the drug is ineffective.

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TUMORS IN THE PAROTID REGION

Direct Surgical Approach and Preservation of Seventh Nerve in Benign Tumors—Description of Radical Operation for Malignant Tumors.

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FOR tumors in the parotid region a direct operative approach, with wide reflection of the skin of the area, has been used over a 12-year period. In the benign group, including mixed tumors of anlage origin, there has been no evidence of recurrence or of paralysis of the facial nerve in patients seen with primary lesions, that is, without previous operation or treatment.

The presence of the facial nerve in the parotid gland and its nearness to the tumor stresses the importance of the anatomy of the area. The facial nerve on leaving the skull enters between the lobes of the gland at the posterior edge just below the ear canal. It divides into two main branches and the branches course through the thin anterior portion of the gland, where separation is difficult.

With this relationship between the facial nerve and the parotid gland, and since a majority of these benign anlage tumors arise in the superficial lobe and in the lower pole, the direct operative approach to these tumors seems well indicated. Tumors may occasionally occur beneath the nerve, in the deep lobe, or may arise in the deepest part of the gland extending toward the pharynx. Although these are seen infrequently, knowledge of this and preparation for a complete dissection of the nerve if necessary by the wide open flap method makes this adaptable for all tumors.

Tumors can and do occur in any part of the parotid gland, including the accessory parotid. Tumors here require protection of the duct as well as the adjacent branches of the facial nerve during removal unless the entire gland is to be removed.

The indirect method of always first identifying a small branch of the facial nerve in the face or neck and tracing it back to the main divisions of the seventh cranial nerve and, incidentally, piecemeal if necessary, removing the tumor was discontinued in 1940. Since the majority of benign tumors lie over the facial nerve, primary isolation of the nerve and secondary removal of the tumor is an

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unnecessary procedure in most instances. In addition, simple avoidance of the nerve by direct approach to the tumor may save nerve function oftener than dissecting out its branches. At least a temporary partial paralysis is a practical certainty with the stretching, exposure and compromised blood supply, though unavoidable, if the individual branches are dissected out.

If, as occasionally occurs, the tumor is found beneath the nerve, the main trunks can be identified as they come into the gland at the level of the tragus over the mandible, by opening down first in front of the ear canal, or by tracing back the first branch encountered.

The approach to be described with the wide skin flap exposure permits change of operative plan for removal if the tumor is found beneath the nerve. Radical type of excision, including removal of the entire gland, ramus and body of the mandible, and neck dissection, can be accomplished with the extension of the incision and the operative field.

General anesthesia is usually requested and is administered through an endotracheal tube, allowing complete view of the side of the face. Curare should not be used to a degree of preventing seventh nerve action if stimulated by close operative approach.

If a local anesthesia is desired, deep block of the second and third divisions of the trigeminal nerve and of the cervical nerves is satisfactory. Local infiltration of the area, however, may be troublesome because of resultant akinesia of the facial nerve.

Description of Direct Approach

The incision (fig. 1) is made to expose the entire area, yet result in the least amount of scar. Starting at the hairline, or above if the tumor is high or in the accessory parotid gland, it is carried down the crus of the helix, over the tragus, under the lobe, then down into the neck parallel to a natural crease.[1] Incisions are never put out in front of the ear unless it is necessary because of a former operation or because skin has to be excised. Through this incision a flap can be raised forward just under the skin and the posterior and inferior edges freed, exposing the entire gland. The flaps and the ear lobe are held retracted with sutures rather than instruments. One assistant has the detail of watching the face and reporting any movement, however slight, to the surgeon, and constant, careful observation is maintained also by the rest of the operative team. Gentle stimulation to each bit of tissue is done by acute pressure before anything is cut that might contain a motor nerve fiber. This stimulation will result in movement of the facial muscles and is reported by the observer to the surgeon. Electrical current stimulation has not seemed necessary.

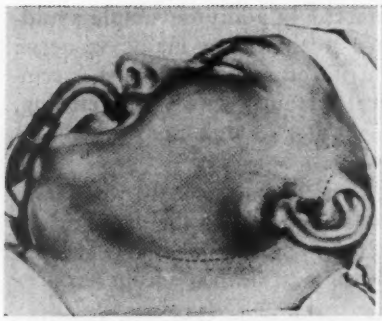

Fig. 1. Incision. Beginning near crus of helix and extending down over the tragus, curving around under the lobe of the ear, then angling down into the neck along a natural crease, a flap is raised far forward on the face which will expose the whole gland and nerve distribution. The posterior edge may also be raised as another flap. (Reprinted from *Surgery, Gynecology and Obstetrics,* March, 1950.[3])

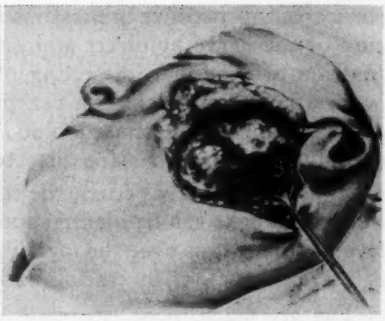

Fig. 2. Removal of tumor under direct vision of it and any nerve branches in the area. Above is the tumor and bed from which it has been removed, showing usual position of the facial nerve beneath the tumor. If tumor is under the nerve, the same process can be used with constant attention to the nerve branches and preservation of them. Wound closed with deep sutures. Fine black silk sutures are used to fix the edges. (Reprinted from *Surgery, Gynecology and Obstetrics,* March 1950.[3])

With the entire gland area uncovered, a transverse opening is made through the fat and the overlying gland to the area of the tumor, being careful of the nerve, with constant awareness that the nerve is present and must not be injured. The tumor can then be dissected free from the surrounding gland with small, sharp scissors, carefully watching and testing as indicated before cutting. The tumor can be gradually delivered out of the wound and extreme caution should be observed as it is elevated because the nerve may be adherent to the deep surface of the tumor, so that if it is looped up with the retraction, it is easily damaged. It is not unusual to observe the main divisions of the nerve lying in the bottom of the cavity left by removal of the tumor (fig. 2).[1]

The minute dissection necessary for careful removal of parotid tumors is not possible without maintaining hemostasis and a dry field, but distant ligation of major vessels is rarely necessary.

For tumors found to be under the nerve the same rules are followed with extreme care of the exposed fibers, again remembering that the nerve is present and should not be cut. If desirable, the branch that is first encountered can be traced back to the trunk and then the other branches followed out. In some instances the trunk itself can be picked up just below the ear canal, at the border of the jaw, or at the internal jugular and followed forward. There may

be instances of long-standing, large, deep tumors that may leave the seventh nerve so isolated that a period of postoperative paralysis might occur, as it does when the plan is followed of taking out the whole gland but leaving the nerve without support or vascular supply across the field.

Distortion of the nerve occurs in large tumors and in those of different location. A deep one posterior may press the trunk of the nerve forward and flatten it out against the jaw. Some tumors of long standing may have such long connection with the nerve that the fibers, although saved, can hardly be expected to carry impulses because of such extensive freeing that is necessary, but ultimate recovery apparently occurs at least partially in spite of extensive freeing.

It is thought preferable to remove a benign tumor piecemeal, taking the chance of recurrence rather than sacrificing the facial nerve. This does not apply, of course, to malignant tumors.

Closure is done by carefully approximating the skin edges with deep, fine silk or catgut, and with fine black silk sutures placed close to the edges. A rubber band is placed at the bottom of the defect and brought out through the sutured incision.

The dressing is important for comfort and for assuring smooth, primary healing. Fine mesh, grease-gauze is placed over the suture line with cotton surgical waste next to this, padding the ear and covering the entire region. A bandage wound around this gives firm pressure fixation to the area.

Irradiation of benign mixed tumors may temporarily retard the growth, but there does not seem to be a large series of substantiated cures. Such treatment may make later removal more difficult (fig. 3).

Malignant growth is always a possibility of any tumor to be removed. Routine frozen section, punch biopsy, or biopsy specimen of one small area of a large tumor may not give a good basis for final decision as to the type of procedure necessary for cure.

If positive evidence of malignancy is found on frozen section, the operation can be extended to include complete removal of the gland, and even neck dissection if indicated. It may be stated, however, that clinical diagnosis of malignancy can be correct to within 3 per cent except for borderline instances of deciding that a small area of a mixed tumor may show such change. This is one of the main reasons for not doing complete removal of the gland for all tumors. There is no need for it or for the risk of seventh nerve paralysis, which has been reported to be as high as 40 per cent when the whole gland has been removed, but leaving the loose nerve intact.

Fig. 3 a. Benign mixed tumor of anlage origin in right parotid gland. b. Photograph of tumor removed. c. Appearance five days following operation. Sutures have been removed but incision is visible. Smooth healing of large flap due largely to fixation and steady even pressure by bulky, firm dressing.

When final study of satisfactory sections shows the tumor to be malignant, this procedure can be considered as having been a method of performing a complete biopsy, and the required treatment can be decided upon. If the capsule has not been ruptured and if there is some question of the microscopic evidence of malignancy, further removal may be omitted at the time with plan for careful follow-up. This is especially true if sacrifice of the nerve is to be fully considered in line with the vagaries of the pathologic picture.

Some form of irradiation may be used if further operation is decided against, since malignant tumors are sensitive. Interstitial irradiation with accurately placed radon seeds has been found effective.

Radical operation for removal of extensive malignant tumors in the parotid gland region can be accomplished by extension of the original operative approach. Removal of the entire gland is possible through the exposure described. The extension may be necessary to include the regional nodes, as these are considered as a part of the cancer field whether they have to be removed or not. The incision is continued down the neck toward the sternal attachment of the sternomastoid muscle and forward to the chin. After flaps have been raised from these incisions, exposing one side of the neck and gland, the lymph bearing area with the sternomastoid muscle

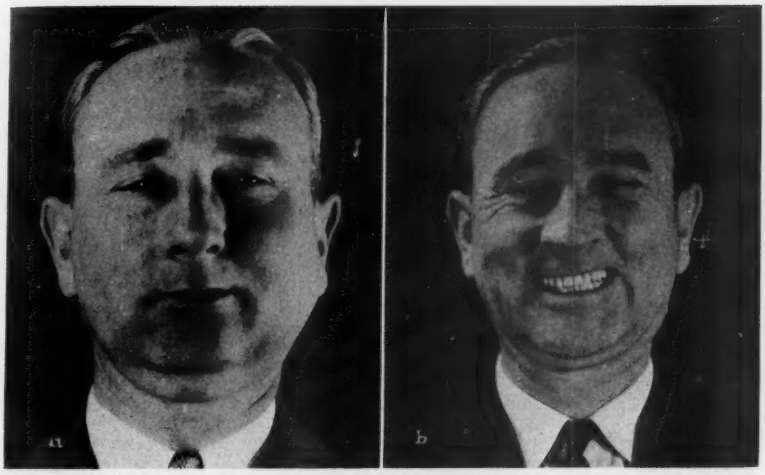

Fig. 4 a. Benign tumor of anlage origin in left parotid. b. Removal by direct operative approach to the tumor, with preservation of seventh nerve function.

and the jugular vein can be removed from below. The jugular vein is ligated at the base of the skull. The jaw itself may have to be removed to get the whole area cleaned out, and if so the mandible is cut through at the mental foramen and disarticulated at the temporomandibular joint. In one mass can be included, then, the lymphatics of neck down to the clavicle, the jaw bone, parotid gland, and any amount of skin thought necessary. By such a block excision a wide margin is provided around the tumor and its potential area of spread. This type of removal is recommended where there is any hope of cure or when there is no distant metastasis, as in the lungs. As the nerve is already paralyzed in these instances by the tumor itself, it is taken in the mass.

Pathologic support of direct approach for benign mixed tumors of anlage origin. Halpert believes these tumors arise from nests of embryonal ectoderm, which do not imitate salivary gland in structure, nor do they distort the gland with growth. Similar tumors may occur in other areas having the same structure as those which occur in the parotid region. Because of the incidental relationship between these tumors and the gland, he suggests that they be called "mixed tumors of anlage origin with mention of site where it happens to occur." This also explains the occasional multiple occurrence of these tumors. His findings lend support to the plan described here for direct removal of the benign tumors (fig. 4).

The distribution of tumors in the salivary glands is 89 per cent

parotid; 10 per cent submaxillary and 1 per cent sublingual with the percentage of malignant tumors in the parotid and submaxillary gland the inverse of their occurrence. In the group being reported here the youngest was 11 years and the oldest 78 years, which is the usual range reported. This does not include tumors of different origin, however, since several hemangiomas in the parotid area were seen in infants. There was no predominant side affected by these tumors but it was found more common in males than females. Bilateral tumors of similar histologic picture may occur.

Report of Types of Tumors in Parotid Gland

The types of tumors encountered and pathologic findings in these tumors are the same as have been described in previous reports by others.

One hundred eighty-seven tumors arising in the parotid gland have been operated on, 100 being benign mixed tumors of anlage origin removed by the direct operative approach to the tumor itself. The microscopic picture, as usually described, was epithelial cells in clumps or cords or in a stellate arrangement in a stroma varying from collagen fibers to cartilage appearing almost normal.

Papillary cystadenoma lymphomatosum comprised 3.4 per cent of the total. Preoperatively they were usually diagnosed as mixed tumors as the history and findings are usually the same. Removal is the same as has been described for benign mixed tumors. It is usually reported that they are less likely to recur. Microscopically, there are tall columnar cells lining irregular cystic spaces. Between the spaces are collections of lymphoid cells.

Six-tenths per cent were lipoma; angioma, 1.4 per cent, and hygroma (lymphangioma), 5.3 per cent. The lipoma was removed by the method described for benign mixed tumors. Hemangiomas, as will be described in a separate report, were treated by a combination of irradiation, injection and excision. Lymphangiomas or hygromas do not require complete removal, but the approach and exposure is the same as described for the mixed tumor. Diagnosis can usually be made as soon as the thin-walled, flat, endothelial-lined spaces are exposed. As much of the ramifying, cystic material is removed as can be safely done without injuring the facial nerve. That remaining is converted into one cavity by breaking the fibrous septa, then packing it with gauze soaked in a sclerosing fluid, as sodium morrhuate. Since these spaces are lined with endothelium, cure can be expected from one diagnostic exploration. Also, repeated exploration and partial removal is thought preferable to injury of the facial nerve with the intimate relationship between it

Fig. 5 a. Complete peripheral facial paralysis which can result from interference with seventh nerve. b. Face supported with strips of fascia lata to corner of mouth anchored to temporalis muscle and fascia. Possibilities of expressive movement shown with establishment of normal nasolabial fold. Lid-slit narrowed by canthoplasty at outer canthus. One operation.

and the many small cystic cavities. These tumors are apt to occur in children where this conservative treatment is especially applicable.

Twenty-two and six-tenths per cent of these tumors in the parotid gland were carcinoma, of which less than 3 per cent could not be diagnosed before operation. The main pathologic consideration of tumors in this region, from a practical standpoint, is the decision whether it is malignant or not. This can be difficult, as will be considered in the discussion of diagnosis. It is interesting but even more difficult to further divide the malignant tumors into the different types of carcinoma. This has been done arbitrarily on the basis of the preponderance of one particular cell arrangement, since often one tumor may contain all three types, sometimes on the same slide. Nine and three-tenths per cent are designated adenocarcinoma, 4.6 per cent squamous cell carcinoma. In the adenocarcinoma there is an alveolar arrangement of the epithelial cells resembling the acini of glands. The squamous cell carcinoma has cords of cells, pearl formation and intercellular bridges. All sections of these two types of tumors may show nothing that looks like parotid gland or benign mixed tumors. It could be imagined that these tumors originated as malignant tumors. On the other hand, another type of carcinoma was seen which was called malignant mixed tumor, since it appeared microscopically like a mixed tumor upon which had been

superimposed malignant characteristics. They comprised 8.7 per cent of the total (fig. 5).

Diagnosis of the Benign and Malignant Tumor in the Parotid. Benign mixed tumors can be diagnosed on the basis of a history of a mass in the parotid region, painless, unrelated to salivary stimulation, increasing slowly or remaining constant in size. Often the reason for the patient's seeking attention is that he has been unaware of the tumor or if he did know of its presence, it has increased in size. On palpation a solid mass can be felt, anywhere in the parotid gland, but not attached to the skin. There is no paralysis of any muscle supplied by the facial nerve. The tumor is most often found in the lower pole of the superficial lobe above the nerve. Sialography adds little to making the diagnosis and is not done routinely. Once the diagnosis of a benign tumor has been made, removal is recommended; allowing it to increase in size or ripen, to make removal technically easier, is not thought good advice in the treatment of any tumor.

Fig. 6. Use of autogenous fascia lata loops to elevate paralyzed face as in figure 5. Loops connect mouth area with fixation in the temporal muscle (fifth nerve muscle). Separate loop from temporal fascia through lower lid to temporal fascia may be used for sag of lower lid. An external canthoplasty also may improve eye appearance and lid function, as was done in figure 5. (Reprinted from *Annals of Surgery*, May 1948[2] and *Surgery, Gynecology and Obstetrics*, March 1950.[3])

Malignant tumors can be diagnosed with but very few exceptions if there is a history of sudden rapid increase in size, paralysis of any branch of the facial nerve, the presence of extension or metastasis, or fixation of the tumor to its surroundings. Positive diagnosis can

be made only by microscopic examination of the tumor except that benign tumors themselves do not cause paralysis and if this has occurred, the tumor is considered malignant even if there is a question microscopically. The interpretation of frozen sections may not prove conclusive. Needle biopsy specimen or even a larger section removed for microscopic study can only reveal the situation in an isolated portion of the tumor. They have been only of confirmatory value where the diagnosis of a malignant tumor was definite, clinically. Since the microscopic appearance can vary so much from one part of the tumor to another, the entire tumor may require removal for a definite pathologic opinion. This "total biopsy" excision is done according to the method described for removal of benign tumors.

Treatment of Facial Paralysis. Removal of malignant tumors in the parotid region often requires the inclusion of the facial nerve in the tumor mass. The possibilities of improvement in this not uncommon deformity are mentioned. If a branch of the facial nerve or the trunk is divided in a benign tumor operation, it should be sutured. If a section of the nerve has been removed, neurosurgical opinion can be secured as to the advisability of nerve graft or anastomosis with another motor nerve. If this is not desirable, support to the paralyzed side of the face can be secured by loops of fascia lata to the corner of the mouth and upper lip, anchored to the temporalis tendon (fig. 6). Temporary support, to maintain tone in the facial muscles, is sometimes recommended while awaiting return of function when a nerve graft or anastomosis has been done. In addition to this support fascia often gives a good degree of conscious movement. The irritation of the eye resulting from the sagging of the lower lid can be alleviated by narrowing of the lid slit at the outer canthus. A loop of fascia passed through the lid from the temporalis muscle and fascia to the frontalis region will give additional support and comfort.

Summary

A description of a direct operative approach to benign mixed tumors of anlage origin in the parotid gland has been given. Usual relationship of these tumors to the facial nerve, with the results of this operation in 100 benign mixed tumors of anlage origin, without evidence of recurrence, or operative damage to the nerve, in a 12 year period are the reasons for proposing its use.

Included is the technic for radical operative removal of malignant tumors in this area with the entire gland, overlying skin, mandible and regional nodes. The possibility of origin of benign mixed

tumors, occurrence and diagnosis of benign and malignant tumors along with types of tumors occurring in this region and removed by us are outlined.

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EXPERIENCES WITH CHEMICAL DECORTICATION

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THE utilization of Streptokinase-Streptodornase† within the pleural space for the rapid lysis of clots and related coagulum was described by Tillett and Sherry.[5] The distinctive fibrinolytic activity of certain hemolytic streptococci was first recorded by Tillett and Garner.[3] It has also been shown by Tillett, Sherry, and Christensen[4] that a product called desoxyribonucleoprotein was present in pus, and it formed from 30 to 70 per cent of purulent exudates. It was later found that a second enzyme changed this very viscid nuclear protein to a thin, watery solution that was easily aspirated. This second enzyme was called Streptodornase.[4] The use of these products in the treatment of hemothorax[2] and empyema[6] has been well outlined and described by Tillett and his group.

The development of these enzymes has added considerably to the armamentarium in the treatment of clotted hemothorax as well as empyema. Tillett[5] and his group have shown that Streptomycin promotes a rather rapid alteration of fibrin and fibrinogen. This is mediated in an enzymatic system which requires the presence of an additional factor present in the serum of normal human blood. This has been referred to by Tillett and his group as the "activatable fibrin-lysing system" and it requires the addition of Streptokinase before it exhibits the qualities of an active fibrinolysis and fibrinogenolysis. The duration of its action has been found to be self-terminating. This precursor that is present in the body collections and exudates has been called plasminogen. As stated above, a considerable constituent of pus found in chronic and acute empyemas consisted of desoxyribonucleoprotein. The enzyme, Streptodornase, acts by changing the thick viscid nuclear protein to a thin solution.

This report deals with 34 cases of various types of intrathoracic coagula. There were 23 cases of traumatic hemothorax, of which 11 were induced by missiles, and 12 were postsurgical. The postsurgical group included 4 cases of pneumonectomy in which the clotted hemothorax was dissolved and removed before thoraco-

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†Referred to as SK-SD.

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plasty was done. There were 7 cases of empyema, and 4 cases of clotted pleural effusion. These pleural effusions followed acute pulmonary infections and were not thought to be tuberculous infections. In each case, the hydrothorax had clotted and the infection was well under control.

The material first used contained approximately 200,000 units of Streptokinase and 40,000 to 70,000 units of Streptodornase.* In each case the commercially prepared preparation was diluted with 10 cc. of normal saline. The injection was made directly into the coagulum in at least three spaces using approximately 3 cc. of the material with each injection.

For these 34 cases, 123 injections were made. On a single patient the injections varied from 1 to 10. Tillett[2] and his group recommend the injection every other day, with removal of the fluid within the pleural space on alternate days. With our first group of cases we began this course of therapy. However, some of the patients were not responding as well as we would like. We therefore changed over to the procedure of doing a thoracentesis each day and injecting the material until no fluid was obtained by aspiration. We have been impressed that a more complete chemical decortication may be obtained with this method and have followed it in the last 17 cases. Tillett[3] has shown that Streptokinase depletes the activatable fibrin-lysing system within the chest fluid and therefore he believed that subsequent injections of the material did not act as well as the initial injection. We believe in these cases that further dissolution of the clot was obtained. This was especially true in the traumatic hemothoraces. With each injection of SK-SD, 100,000 units of penicillin and 1 Gm. of Streptomycin was introduced. Parenteral chemotherapy was also used.

Toxic reactions were essentially the same as those found in the literature and were chiefly limited to pyrogenic. Frequent leukocytosis was encountered. Arthralgia was severe enough to cause distress in several patients. It was a distinct clinical impression that the best lysis was obtained in that group of patients that had the more severe systemic reaction to the enzyme. Aspirin has been used with the last 8 patients, and a considerable reduction in the febrile response was noted. In 2 cases of chronic empyema severe hemorrhage was encountered after the use of SK-SD. In 1 case, transfusion was necessary. Three of the cases of clotted pleural effusion developed bloody effusion after injection of SK-SD. We believe that hemorrhage may be a distinct disadvantage of the use of

*For the first half of this study the material was supplied by the Lederle Laboratories, Pearl River, N. Y. The last 14 patients in this study have been treated with the commercial preparation of Varidase (Lederle Laboratories).

SK-SD in some cases. We think that the earlier the treatment is instituted the more rapidly the coagulum will be lysed, and therefore the quicker the underlying lung may be expanded. This is conducive to better pulmonary function and the preservation of the integrity of the thoracic cage. In each case, intensive chest exercises associated with parenteral and local chemotherapy has been used.

Clinical Results

For the sake of clinical evaluation and clarity of presentation, the cases are divided initially into three groups. The results are shown in Charts 1, 2, and 3.

The first group (chart 1) shows the results of chemical decortication in cases of traumatic hemothorax. There was a total of 23 patients in this group: 12 were postsurgical and 11 were extrinsic trauma. Four of the postsurgical were pneumonectomies that developed a clotted coagulum which was later transferred to an oleothorax or thoracoplasty. Results as tabulated in this group were excellent, good, fair, or poor. A case was considered excellent if complete decortication of the chest was obtained and a good posttreatment roentgenogram was seen. Good results were considered to be a case in which decortication was satisfactorily obtained, but the roentgenogram still showed some thickening and evidence of remaining peel. The fair group included those in which some decortication was obtained, but at the end of the treatment period there was still a considerable pocket left within the pleural space. The poor group consisted of those in which little or no results were obtained from the use of the SK-SD. In the group of traumatic hemothorax we had 10 excellent results, 5 good results, 5 fair results, and 3 poor results. This gives an over-all statistical figure of 87 per cent satisfactory results. Several of these cases continued to clear their peel on chest exercises and physiotherapy.

The patients were treated for their clotted hemothorax anywhere from 3 to 40 days following their initial trauma. It was a very distinct clinical impression, as well as borne out in our statistical results, that those who were treated early following the initial clotting of their hemothorax obtained the best results. Analysis of the poor results of this group reveals that two occurred postpneumonectomy in children in which a period of almost a month had elapsed before an attempt at decortication was made. In one of these, a small space was obtained to convert to an oleothorax. In the other, absolutely no results were obtained. One poor result was obtained in a postoperative decortication that developed a hemothorax fol-

CHART 1

Results of Chemical Decortication of Traumatic Hemothorax

Patient	Trauma	Days Before SK-SD	Number of Injections	Toxic Signs	Result	Remarks
3	Rt. pneumonectomy	38	3	Malaise, fever, leukocytosis	Fair	Converted to oleothorax
5	Pul. valvulotomy	31	5	Fever, leukocytosis, arthralgia, malaise	Good	Developed empyema later; controlled by aspirations
6	Excision of tuberculoma	37	2	Malaise, fever, chills, leukocytosis	Fair	Bled 10 days after surgery
7*	Pulmonary infarct	7	2	Fever, malaise	Excellent	None
8	Left pneumonectomy	29	3	Fever	Poor	No results here
9	Rt. pneumonectomy	21	3	Malaise, fever	Poor	Small space obtained and converted to oleothorax
12	Stab, rt. chest	34	10	Negligible leukocytosis	Good	Results obtained after three weeks R_x
13	Lobectomy, RUL	3	1	Undetermined	Excellent	Developed bronchopleural fistula 24 hours later
15	P.O. thoracotomy	22	3	Fever, malaise, pain, leukocytosis	Excellent	None
16	P.O. decortication	13	5	Fever, pain	Poor	Chronic empyema decorticated, residual hemothorax
17	G.S.W. Left	30	5	Fever, malaise, pain, leukocytosis	Excellent	Formed fluid for 2 wks. after SK-SD

*Hemothorax followed embolism after appendectomy.

CHART 1 (*Continued*)

Patient	Trauma	Days Before SK-SD	Number of Injections	Toxic Signs	Result	Remarks
19	Left pneumonectomy	22	1	Fever, leukocytosis	Excellent	Converted to thoracoplasty
20	Lobectomy, LUL	40	5	Pain, fever	Fair	Thoracoplasty
21	Stab, left	16	3	Mild	Fair	Still has pocket not lysed
22	G.S.W. Left	7	8	Fever, malaise, leukocytosis	Excellent	None
23	Stab, right	3	2	Mild	Excellent	None
24	Stab, right	4	3-rt. 4-lft.	Fever, leukocytosis	Excellent	Bilateral clotted, both sides excellent
27	Lobectomy, RLL	31	3	Fever, malaise	Good	Clotted soon after surgery
28	Lobectomy, RLL	28	3	Fever, severe malaise	Good	None
29	Stab	5	1	Fever, leukocytosis	Excellent	None
30	G.S.W Left	7	6	Fever, pain, malaise	Fair	Developed empyema and finally cleared with aspirations
31	Stab, left	12	3	Mild	Excellent	None
32	Fract. ribs	14	1	Fever, leukocytosis	Excellent	None

lowing surgery. Two weeks later an attempt was made to decorticate a small anterior pocket of hemothorax without success. In no case of attempted decortication chemically for clotted hemothorax has a surgical decortication been necessary.

The possibility of bronchopleural fistula has been mentioned by Tillett[2] and others in the use of SK-SD in the early postoperative period following pulmonary resection. We had one such case to develop in a man who had a right upper lobectomy for a lipoid granuloma. Following surgery, he had a rather profuse hemorrhage in the first 24 hours. This hemorrhage was finally controlled by conservative means. On his third postoperative day an attempt was made to aspirate the fluid within the pleural space and it was found to be clotted. Streptokinase-Streptodornase was injected on his third postoperative day, and he developed a bronchopleural fistula 12 hours following. Satisfactory decortication, however, was obtained and the fistula was later closed by thoracoplasty. One case of clotted coagulum following pneumonectomy developed a bronchopleural fistula before the introduction of SK-SD. This fistula emptied into a small central pocket, and decortication was attempted chemically. The patient had a satisfactory decortication, and apparently did not enlarge his bronchopleural fistula which was later closed by thoracoplasty. He evacuated approximately 1500 cc. of blood through the fistula. It would have been better if a thoracotomy tube had been placed into the pocket before decortication.

The most gratifying results have been in those cases of traumatic thorax from stab and gunshot wounds or multiple contusions in which a large clotted hemothorax developed. In all of these cases the initial hemothorax was considered to be uninfected, but in 2 of the 12 cases, empyema later developed under the treatment with SK-SD and chemotherapy. In both cases this empyema responded satisfactorily to continued injections of SK-SD and thoracenteses. In no case in this group was surgical decortication necessary. Since the use of SK-SD, surgical decortication has not been necessary in any of the traumatic cases seen at the large city hospitals. We feel that this is a distinct advantage over previous methods. The number of injections of SK-SD in this group varied from 1 to 10, the average being about four injections. There was 1 case of a bilateral clotted hemothorax requiring three injections of SK-SD on the right side and four on the left to completely clear the chest. A very satisfactory result was obtained in this case. A typical case is presented in detail at this time:

Case Report

M. C., a 20 year old Negro man, was admitted to the Chest Service, Grady Memorial Hospital, on Oct. 13, 1951, in shock with a stab wound to left posterior chest. There was evidence of compression in the left chest with a left hemopneumothorax, and a thoracotomy tube was inserted into the left second interspace. The patient was cross-matched for transfusion and three units of blood were given. He was transferred from the Emergency Clinic to the Ward. His pressure remained at shock levels for several hours in spite of repeated blood transfusions. Later he began to respond and pressure began

Fig. 1. Case M. C. Stab wound of chest before and after decortication.

to rise. About six hours later, his pressure reached 100/70. He continued to bleed within the pleural cage and it was necessary to clamp off his thoracotomy tube at intervals. Arrangements were made to do an exploratory thoracotomy to stop the bleeding, when the patient apparently came out of shock and the bleeding ceased. The tube was remained clamped for another 12 to 14 hours, and no increase in pressure was noted within the pleural space. On October 15 an attempted thoracentesis was done in the left pleural space, but only approximately 100 to 150 cc. of bloody fluid was obtained. For the next three days attempted thoracenteses in multiple sites yielded no evidence of fluid. On October 21 no fluid was obtained from the pleural space, and repeated roentgenologic study showed evidence that approximately 50 per cent of the left thoracic cage was obscured by a hemothorax. SK-SD was injected into the coagulum in multiple sites. On October 22, 800 cc. of fluid was removed and SK-SD was again injected. On October 25, no fluid was obtained and roentgenogram showed a small posterior pocket. An additional injection of SK-SD was used on November 3. The following day 300 cc. of fluid was removed. The fluid then decreased rapidly, and the patient was discharged five days later, apparently in good condition (fig. 1).

Also included in this group of traumatic pneumothorax is 1 case of massive pleural bleeding following a large pulmonary embolus.

This patient was a 28 year old white man who had had an appendectomy two weeks before and a sudden onset of pleural pain with evidence of an infarct and embolism to the right upper lobe. A massive pleural effusion developed which on tap proved to be pure blood that rapidly clotted. SK-SD was used in this case with excellent results (fig. 2).

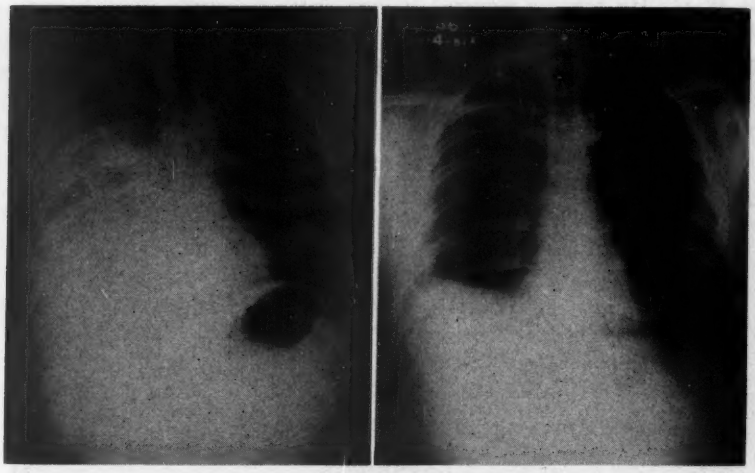

Fig. 2. Results in chemical decortication following hemothorax from pulmonary embolism.

The second group (chart 2) consists of 7 cases of empyema treated with SK-SD. This included 4 cases of postpneumonic empyema, 1 case of empyema following a subphrenic abscess, 1 following a lung abscess with rupture into the pleural space, and 1 of a gunshot wound to the chest. The duration of the disease from onset to initial treatment was from 14 days to two years. The number of injections varied from two to seven, the average being three. Various organisms were obtained from these wounds: the major one being *Staphylococcus* and pneumococci with a mixed flora in several.

Results in this group of cases were not as good as those seen in the traumatic hemothorax. There were 2 cases that had excellent results with complete resolution of the disease. Both of these cases were following pneumonia and were relatively early in the process of the disease. One case could be considered a good result three weeks following the onset of the pneumonia. The remainder of 4 cases show a poor result with failure of resolution of the empyema. In 2 cases complications prevented further therapy. The complica-

CHART 2

Results of Treatment of Empyema

Patient	Initial Disease	Duration to SK-SD	No. Injections	Cultures	Results	Remarks
10	Pneumonia	14 days	3	Staph.	Excellent	Associated pneumothorax
14	G.S.W.Chest	2 years	2	No growth	Poor	Severe toxic reactions
18	Pneumonia	24 days	7	No growth	Good	Large pocket cleared well
25	Pneumonia	22 days	3	Staph.	Poor	Unable to clear pocket
33	Subphrenic abscess		2		Poor	Had severe hemorrhage into cavity
34	Chronic empyema with draining abscess	22 months	3	Mixed	Poor	Developed severe hemorrhage. Required transfusions
26	Pneumonia	21 days	3	Pneumococci	Excellent	None

CHART 3

Cases of Clotted Pleural Effusion

Patient	Initial Disease	Duration —to SK-SD	Number of Injections	Toxic Symptoms	Results
2	Pneumonitis	14	6	Fever, malaise	Excellent
4	Pneumonitis	49	3	Fever, pain, leukocytosis	Excellent
11	Pneumonitis	10	2	Fever, leukocytosis	Excellent
1	Pneumonitis	21	5	Fever, malaise	Good

tions in this group were more severe than in the group of the traumatic hemothorax. Two of these cases, both chronic empyema, had rather severe hemorrhage following the introduction of SK-SD. One of these patients was a 14 year old boy who had developed his empyema 14 months before. The empyema was drained externally. A very thick peel with pleural cutaneous fistula was present. Attempt was made to decorticate this with SK-SD, but severe hemorrhage followed. Transfusions were needed in this patient.

As stated above, we believe that in this group of cases there is a definite chance of SK-SD producing hemorrhage and this is a definite hazard in the use of this drug. Although our experience is rather limited with the empyema group, we do feel that the results here were not as good in this small series. A detailed history is presented on one of the cases of chronic empyema treated with SK-SD.

Case Report

B. P., aged 9 years, was admitted to the hospital on Dec. 26, 1950, with a history of a week's illness consisting of high fever, left chest pain, and a persistent cough. He had had chills and fever on several occasions. He was placed on intensive antibiotic therapy and followed with roentgenologic study

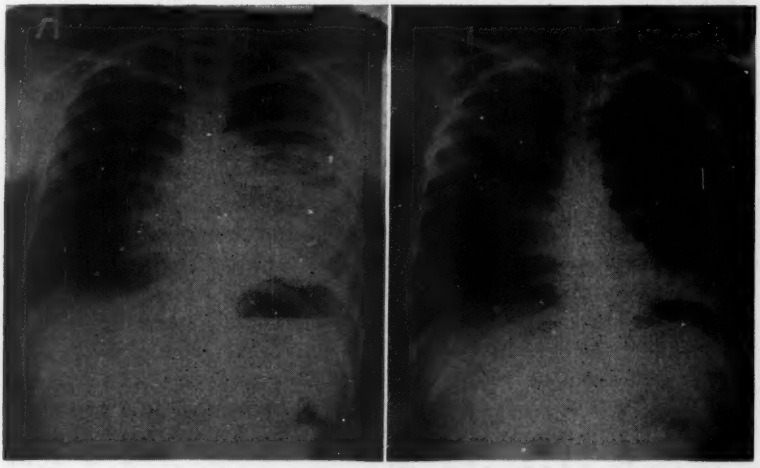

Fig. 3. A case of chronic empyema treated by SK-SD.

which showed the development of fluid within the left chest. The patient was a rather thin child who was markedly febrile and somewhat dehydrated with a definite lag over the left hemithorax. Dullness to percussion was noted over the posterior third of the left chest; breath sounds were absent in this area. Thoracentesis on admission yielded thick, purulent material which, when sent to the laboratory, showed no organisms on growth. The empyema was treated by repeated injections of SK-SD. All pockets were aspirated until

dry. The empyema became multilocular. Seven injections of SK-SD were required. Following each injection the patient's temperature went to 101 F. He had malaise and evidence of some arthralgia. The result was excellent. The patient became afebrile, the pockets subsided in size and became free of pus with only small loculated air sacs remaining (fig. 3).

The third and final group (chart 3) consists of 4 patients who developed pleural effusion following an apparent pneumonia, nonspecific in type. This pleural effusion clotted and formed an unremovable coagulum. These patients were seen 10 to 49 days following their initial illnesses and, in each case, multiple thoracenteses had been attempted to remove this fluid without success. The average number of injections of SK-SD in this group was four, 1 case requiring only two, and 1 case requiring six. These patients all had toxic symptoms: fever, malaise, leukocytosis and arthralgia.

The results in 3 of these cases were excellent, and in 1 case the result was considered good. This particular case had some degree of peel left after the final removal of fluid was obtained. A detailed history on one of these cases follows:

Case Report

W. H., a 3 year old white boy, with onset 10 days previously of fever, malaise, cough, and progressive dyspnea, was admitted to the hospital. Roent-

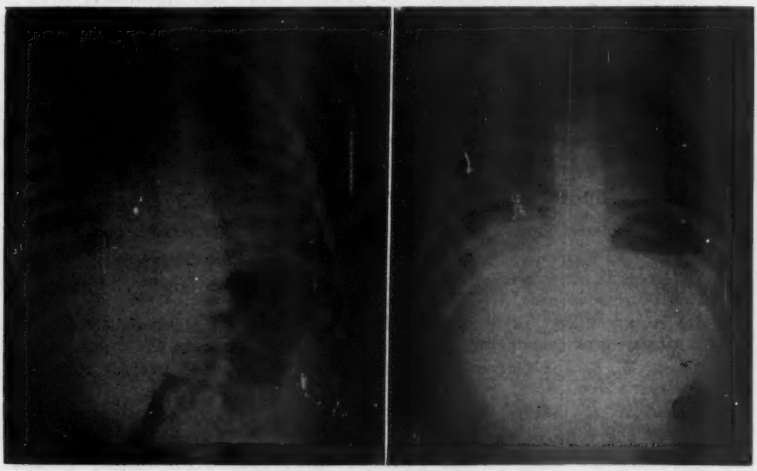

Fig. 4. Case of a 3 year old child with massive clotted hydrothorax treated with SK-SD.

genogram of the chest showed a massive hydrothorax on the right side. Attempted thoracenteses were entirely unsuccessful. SK-SD was injected into the pleural cavity. The patient had a spike of fever, increased cough, and pain in the chest. The following day approximately 400 cc. of fluid was removed

from this child's chest and an additional installation of SK-SD was made. The following day thoracentesis yielded 200 cc. and on the following day, no fluid was obtained. Roentgenograms showed satisfactory clearing. The results were excellent, and the patient was discharged with no further difficulty (fig. 4).

We have used SK-SD in the treatment of chronic tuberculous empyema. The result of this group is to be reported in a separate paper.

Summary

Thirty-four cases of clotted coagula within the pleural space have been presented. Twenty-three cases of traumatic hemothorax clotted received SK-SD with an 87 per cent satisfactory result in these cases. Seven cases, chronic empyema, were treated with SK-SD within the coagulum. Only 3 of these had a satisfactory result—those in which the empyema was quite early in its progress. Four cases of clotted pleural effusion, nonspecific in nature, were treated by this method. There were four satisfactory results. Toxic symptoms were noted, in general, to be: malaise, fever, arthralgia, and leukocytosis. In no case was the toxic results of this nature severe enough to discontinue treatment. In 2 cases, major hemorrhage was encountered; both were chronic empyemas, and in both cases the treatment was discontinued. We believe that this definitely may be a hazard in the use of this drug. We have used the multiple-injection method with daily thoracenteses; and when we thought the chest was not completely empty of its coagulum, repeated doses of the SK-SD were used. This material has definitely been established as a clinical help in the treatment of intrathoracic coagulum and should be tried before any surgical decortication is undertaken. This is especially true in clotted hemothoraces.

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VALUE OF CHLOROMYCETIN* IN COLONIC SURGERY

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USE OF antibiotics has produced profound changes in colonic surgery.[1] Multiple stage procedures, exteriorization of the large bowel and aseptic methods of end to end anastomoses over clamps, all of which reduced the mortality and morbidity of colonic surgery in the last decade, have in a large measure become obsolete. Open colonic anastomoses with direct approximation of tissues that have not been crushed by clamps can now be performed with practically the same risk as with anastomoses of the stomach and small bowel. We have discontinued use of the Rankin clamp and end to side anastomosis-enterocolostomy after resection of the right half of the colon and are now doing direct end to end anastomosis of terminal ileum to mid-colon. We no longer employ Stone clamps when doing a low anterior resection using the open method as advocated by McNealy.[8] We have discontinued the Lynch operation and do not recommend any procedure less radical than the Mile's abdominoperineal resection for tumors in the lower rectum. We now have an effective measure to combat the overwhelming infection in the poor-risk case, which in the past confounded our surgical judgment in evaluating the risk from surgical infection and shock compared with the risk of malignancy.

The choice of antibiotic continues to change with introduction of newer chemotherapeutic agents. Having followed the recommendations of Poth,[10] we affirm the value of the nonabsorbable sulfa compounds, Sulfasuxidine and Sulfathalidine, in preparation of the large bowel for colonic surgery. The newer drug, Neomycin,[11] will certainly sterilize the colon contents even quicker, but these agents are ineffective for infections outside the intestinal wall and other antibiotics must be used. While sulfadiazine and later penicillin were and are effective, we believe that the newer antibiotics offer greater advantages. The spectrum of organisms attacked is, for the most part the same with Aureomycin, Terramycin and Chloromycetin. It is our opinion, however, that toxic effects of Aureomycin and Terramycin on the gastrointestinal tract and particularly the rectum[9]

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*Parke, Davis & Company supplied Chloromycetin and a grant to support this study.

determines our choice for the least toxic of the three — Chloromycetin.® Chloromycetin with minimal toxic effects has been found effective in peritonitis,[2] infections of soft tissues outside the intestine, urinary infections and in pulmonary infections[6] which complicate colonic surgery. A synergism has been shown to exist with the use of Chloromycetin and Dihydrostreptomycin in combination. Strains of organisms which become resistant to Chloromycein are at the same time made more sensitive to Dihydrostreptomycin. As Dihydrostreptomycin will reach its maximum effect within 48 to 72 hours, we give it in combination with Chloromycetin before colonic surgery. The patient is continued on intravenous Chloromycetin for several days immediately following colonic surgery and as soon as oral therapy is resumed, the combination of Chloromycetin and Dihydrostreptomycin is given again for a short course.

As peritonitis is the number one complication and cause of death following colonic surgery, we would like to report our clinical experience with the use of Chloromycetin in cases of peritonitis.

On the Surgical Service at Grady Memorial Hospital, 12 cases of septic peritonitis following ruptured appendicitis were treated with Chloromycetin intravenously, intramuscularly and orally. There was one death in this series, making a mortality of about 8 per cent. It is interesting to note that Dr. Frank K. Boland[3] reported a series of 30 cases of peritonitis at the same hospital from 1927 to 1931 with a mortality of 30 per cent. Also, that Doctors Dan Elkin and Wadley K. Glenn[7] reported a series of 82 cases of peritonitis for the years 1932-1934 treated by the Oschner regime without immediate surgery until peritonitis was controlled; mortality dropped to 18 per cent.

Over-all mortality for our small series of 12 cases of septic peritonitis was 8 per cent and the only fatality occurred in a case that was operated on despite spreading peritonitis. There were no deaths in the 6 cases treated conservatively with Chloromycetin and time allowed until the peritonitis could be controlled, followed by interval appendectomy. Of the 6 cases of ruptured appendicitis and peritonitis receiving immediate operation, there was one death. Dr. Marvin Mitchell and the senior author[4] reported 100 cases of septic peritonitis in white persons following ruptured appendicitis from Grady Hospital with a mortality of 23 per cent in 1936, before chemotherapy was available. Our conclusion then was that "when confronted with a case of peritonitis for curative treatment, it would seem the best procedure would be to avoid immediate operation." This seems true today even with chemotherapy.

Seven cases of peritonitis resulting from perforated peptic ulcer

were treated with Chloromycetin with one death. The fatality, a 69 year old man in critical condition on admission, had an electrocardiogram showing acute myocardial infarction. Medical consultation advised against surgery and the patient was treated conservatively with Levine tube, intravenous fluids and Chloromycetin and Dihydrostreptomycin parenterally. The patient remained in critical condition and died on the fifth hospital day with clinical evidence of another cardiac infarction. Since peritonitis following perforated peptic ulcer is chemical rather than septic, we urge immediate operation here, chemotherapy being used as an adjunct. We do not imply that, in this type of peritonitis, surgery should be delayed or sole reliance placed on any chemotherapeutic agent.

Chloromycetin has now been used in 24 cases with traumatic perforating injuries of the abdomen involving small bowel, large bowel and urinary tract, without any mortality. These patients had peritoneal contamination and gross soiling but as they were seen immediately after the trauma, septic peritonitis had not developed. In no case did septic peritonitis develop. These traumatic penetrating abdominal injuries, seen routinely at the Grady Hospital Negro Section in Atlanta, consisted mainly of stab wounds by knives and ice picks and gunshot wounds of all calibers.

The most serious case in this series was a 61 year old man with a gunshot abdomen and multiple perforations of the small bowel, several perforations of the large bowel and injury to the kidney. It was necessary to do a small bowel resection with simple closures of many perforations and suture of the kidney. Colostomy was performed and the patient given Chloromycetin, 500 mg. intravenously, every six hours for four days. Then he was given 250 mg. of Chloromycetin combined with 250 mg. of Dihydrostreptomycin orally every four hours for 12 days. The patient had a stormy convalescence but no peritonitis ensued. Five weeks later, he developed postoperative obstruction from adhesions; this was relieved surgically and the patient is now awaiting closure of colostomy.

These cases proved to us the value of Chloromycetin in prevention of septic peritonitis following traumatic perforation of the intestine with peritoneal soiling.

Use of Chloromycetin, after colon surgery, in prevention and treatment of postoperative complications from infections elsewhere in the body, can best be illustrated by mentioning the other fields of surgery in which the results have been gratifying.

In 18 orthopedic patients, 14 neurosurgical patients and in 21 patients in which chest surgery was performed at this hospital, Chloromycetin was used with favorable results. Detailed reports

of these cases will be of interest mainly to their respective specialty groups. In 61 other general surgical patients including diabetes associated with infection, postoperative wound infections, cellulitis and burns, Chloromycetin was found effective. Our total number of cases treated on the surgical service at Grady Hospital is 163 patients and this number added to the 107 patients treated for proctologic conditions and previously reported[5] brings the total series treated with Chloromycetin to date to 270 cases. It is important, I think, to emphasize again the absence of diarrhea, the absence of proctitis, of pruritus ani, and pruritus vulvae and the absence of nausea and vomiting definitely attributable to the medication. Only 1 case in this series developed urticaria and this was promptly relieved by Benadryl.® In no case have we seen any evidence of depression of the hemopoietic system resulting in aplastic anemia or agranulocytosis. We are now certain that Chloromycetin is effective with very minimal untoward side effects.

We have now used Chloromycetin and Dihydrostreptomycin in combination for preoperative preparation and postoperative medication in 17 cases in which a colon resection or a Mile's abdominoperineal resection was performed. These included resection of the transverse colon for adenocarcinoma with open end to end anastomosis; a 72 year old woman with lesion in the descending colon, with resection and end to end anastomosis; resection of ascending colon for carcinoid of terminal ileum and cecum with open ileotransverse colostomy with end to end anastomosis; a colectomy of redundant colon with previous volvulus; three anterior resections for tumors in the lower sigmoid; one proctosigmoidectomy with pull-through operation for chronic stricture of rectum; and nine abdominoperineal resections. There were no fatalities in this series and postoperative convalescence was uneventful in all. Temperatures did not usually exceed 100 F. and 1 patient left the hospital as early as the ninth postoperative day.

We are now giving 500 mg. of Chloromycetin combined with 500 mg of Dihydrostreptomycin (which means two tablets) every six hours for four days before operation. Stool cultures on the third and fourth day show no pathogens. Postoperatively, patients are continued on Chloromycetin, intravenously, 0.5 Gm. with intravenous fluids every eight hours for two or three days. When oral liquids are begun, one compressed tablet containing 250 mg. of Chloromycetin and 250 mg. of Dihydrostreptomycin is given every six hours for five or six days. No incompatability has been noted following use of Chloromycetin directly with intravenous fluids, dextrose solutions, saline, 5 per cent alcohol or in combination with vitamin concentrates.

SUMMARY

1. Chemotherapy allows the surgeon to perform colon resections with direct end to end anastomosis without trauma of clamps and with accurate hemostasis and approximation.

2. Chloromycetin is an effective agent in the prevention and cure of septic peritonitis.

3. Chloromycetin is effective for infections that may arise in other parts of the body as complications of colon surgery.

4. Chloromycetin has minimal toxic effects.

5. Our experience with Chloromycetin in colon and rectal surgery has proved its worth.

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CHOLEDOCHODUODENAL FISTULA: REPORT OF A CASE COMPLICATING DUODENAL ULCER

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MOST fistulas of the gallbladder and the common duct are related to primary biliary diseases. Seldom is the occurrence of a fistula between the intestinal tract and the gallbladder or bile ducts encountered as a complication of peptic ulcer.[3,9]

Hicken and Coray[5] reported 100 gastrointestinal biliary fistulas in their routine performance of 2,000 cholecystectomies. Puestow[10] found that 3.2 per cent of his patients having an operation on the biliary tract also had this complication. Hicken reported 15 such cases, representing an incidence in biliary tract surgery of 4.2 per cent. It has been stated that 1 out of every 25 patients requiring this type of surgery will possess some type of fistula. Judd and Burden,[6] in 1925, reviewed the reported cases and found that the lesions were seen more frequently at operation than at autopsy.

There have been reports[8,11] of the establishment of traumatic fistulas between the small intestine and the gallbladder. A fistula into the stomach or the colon is less frequently encountered. Intestinal biliary fistulas develop following acute infectious lesions of the gallbladder, with stones eroding the wall of the gallbladder and adjacent or attached viscera. It occurs as the result of necrosis, infection, and the passage of stones into the intestinal tract; an opening remaining between the two viscera. It has been shown that these fistulas may close, provided no obstruction exists in the biliary tract or within the lumen of the bowel below the opening. Numerous reports[1] have been made of gallstones passing into the intestinal tract and producing an intestinal obstruction.

Due to the location of duodenal ulcers, the establishment of a communication by erosion is not often expected. Most ulcers are located in the first portion of the duodenum; and, when the erosion takes place, perforation occurs without involvement of the biliary tract. However, the formation of fistulas may be seen more often in extensive, large, and long-standing lesions. This would be anticipated when the head of the pancreas is invaded by an acute ulcer, for the pancreatic enzymes may exert an influence on the necrosis and development of such lesions. Also if the gallbladder has been adhered from some previous disease, a fistula could develop when penetration of the ulcer occurs.

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There are no specific symptoms of a communication between the biliary and the intestinal tracts. When such an opening develops from a previously existing cholecystitis complicated with stones, the symptoms would be referable to the biliary tract. However, it is recognized that these symptoms are variable and, in many instances, may even be bizarre. The first symptoms may be that of an intestinal obstruction, in which a large stone has eroded the wall of the gallbladder and intestinal tract,[2] only to be lodged in some location of the small intestines, most frequently at the ileocecal valve. The diagnosis of such a complication is not usually made until operation.

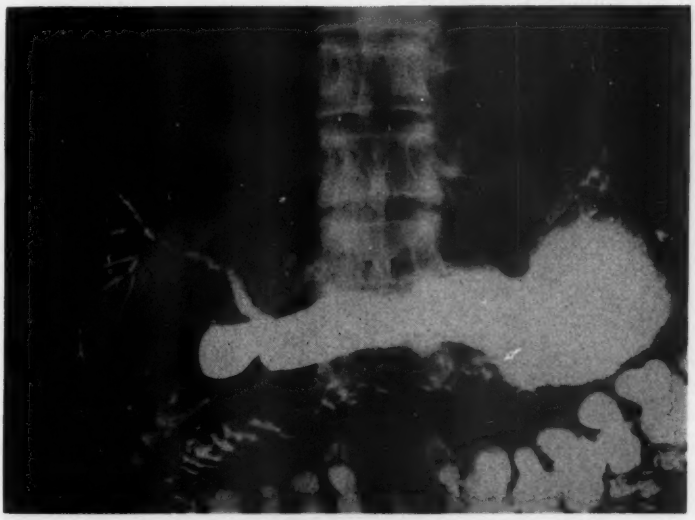

Fig. 1. Roentgenogram of barium filled stomach and duodenum demonstrating the entrance into the bile ducts.

Erosion from a previous ulcer of the duodenum, as in the present report, is rarely seen. The symptoms are those of an intractable ulcer (often with associated hemorrhage) or possibly those of a perforation. In any event, the effect of the entrance of the intestinal contents into the bile ducts may account for secondary infection, extending into the liver. When such develops, an infectious cholangitis, with fever and chills, may be expected. It is surprising how few symptoms the regurgitation of the intestinal contents into the liver produces. Definite changes occur, in long-standing communications, both from the infection and also from the development of late impairment to liver function.

Recognition of these fistulas before and at operation may be difficult or overlooked. In the routine roentgenologic examination of

the gastrointestinal tract,[4,1] diagnosis can be made. Occasionally, however, the outline of the biliary tree is not shown if there is a communication between the duodenum and the gallbladder. On the other hand, a communication between the duodenum and the common bile duct allows a rapid entrance of the barium into the common bile duct and its connecting radicals within the liver. The pancreas may be secondarily involved by such a communication, particularly when the ducts to the pancreas are so situated that a free entrance of bile and intestinal contents occurs. The demonstration of air in the bile ducts or gallbladder is occasionally seen, this being evidence that a communication exists.

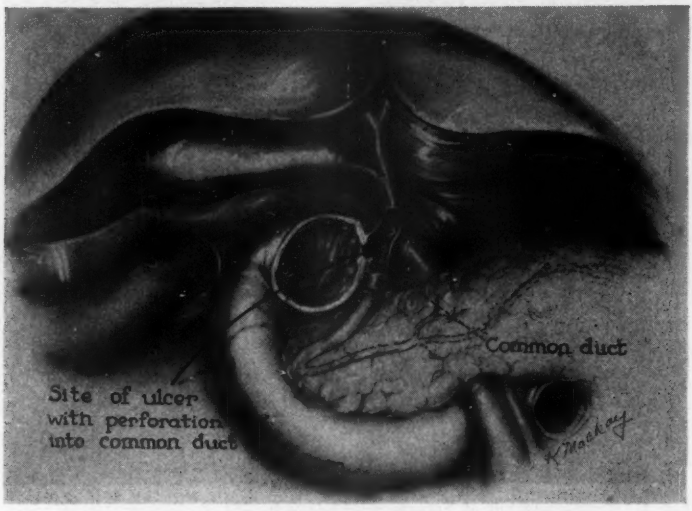

Fig. 2. Drawing showing the duodenal ulcer with an opening into the common bile duct.

The prognosis in these abnormal openings is directly related to the factors involved in their development; namely: the degree of biliary disease, and the extent of involvement of the duodenal ulcer. In the long-standing process, the direct entrance of the intestinal contents, as has been mentioned before, accounts for the liver dysfunction or associated complications from such a reflux into the biliary tract. If the ulcer has eroded structures such as the head of the pancreas, the prognosis will be dependent on the degree of involvement of these organs. An ulcer in this area would not be expected to heal spontaneously but would become progressively worse. In the case of an opening between the gallbladder and some part of the intestinal tract, the prognosis would be much better

unless infection has superseded. Kerr[7] has reported an instance of bleeding directly from the common duct into the intestinal tract; and such must be expected when this type fistula exists, particularly in the presence of a long-standing infection.

Biliary fistulas in the absence of an obstruction will usually heal spontaneously. However, if there is any interference with the flow of contents by an obstruction such as stones or stenosis, closure will not occur. Treatment is directed toward the factors producing the lesion. It is important to have a knowledge of the anatomical defects prior to operation if complete restoration is to be made. When primary gallbladder disease exists, either in the presence of chronic cholecystitis with or without stones, an attempt should be made to remove the gallbladder and to close the defect that exists in the duodenum. This may be difficult, due to the size of the opening in the duodenum and the associated inflammatory changes. The opening into the common duct is not easy to correct, since it would necessitate resection of the common duct with either reimplantation of the duct into the duodenum or anastomosis of the gallbladder to some portion of the intestinal tract. In the presence of a duodenal ulcer, attention must be directed to the ulcer if it is one of the intractable forms where the sympoms are long-standing. It is believed that, when the ulcer can be resected, this should be done. This may constitute the first stage of procedure. The involement of the ulcer and the common duct may necessitate the resection of the ulcer as well as the common duct, with either reimplantation of the duct into the duodenum or implantation of the gallbladder into the intestinal tract whenever possible.

Case Report

U.V.D., a white man, aged 42 years, was admitted to Emory University Hospital on Feb. 1, 1950, complaining of nausea and vomiting. In 1939, the patient began to have a gnawing epigastric pain, which was relieved by taking anti-acids. On a number of occasions he had tarry stools; and, he vomited coffee-ground material. In 1943, he began to pass tarry stools and again vomited coffee-ground material. In April, 1947, a roentgenologic examination revealed a marked deformity of the duodenal cap with the suggestion of a duodenal ulcer. It was also noted that, when the barium reached the duodenum, it immediately outlined a tract which coincided with that of the common duct and which extended into the bile ducts within the liver. The administration of oral priodax failed to visualize the gallbladder. No stones could be demonstrated. The symptoms persisted for about 18 months, during which he began to lose strength, became dizzy, and was able to eat only liquid foods. On taking solid food, he would become nauseated and vomit a large quantity of material two to three hours later. He lost approximately 20 pounds during the last three years.

On Jan. 16, 1950, a gastrointestinal series revealed that the pylorus was

almost completely obstructed; but the barium, on reaching the duodenum, would again pass into the common duct and then out into the bile ducts within the liver. Preparations were made for operation; and on February 2, under general anesthesia, the abdomen was explored. The stomach was found to be tremendously dilated. An obstructive mass, the result of an old, partially healed ulcer near the pylorus in the first portion of the duodenum, was revealed. There was, within the center of this mass of adhesions, a communication between the duodenal ulcer and the common duct. Due to the tremendous amount of fixation, this was not disturbed; but a partial gastric resection was done, entailing the removal of approximately three fifths of the stomach. A gastrojejunostomy of the polya type as modified by Hofmeister was performed. The patient had an uneventful convalescence. He was dismissed on Feb. 16, 1950, taking a bland diet without any discomfort. He has since gained weight and is free from symptoms.

Summary

A review of the fistulas between the biliary and the gastrointestinal tract is made. The most common location is between the gallbladder and the duodenum. Most of these occur as a result of some complication of biliary disease, in which there is an associated stone. The development of such a communication between the duodenum and the biliary tract can occur as a result of an eroding duodenal ulcer. This usually develops as the very rapidly fulminating type, in which there is perforation, hemorrhage, or involvement of the pancreas. A patient with the latter type is reported and was treated by partial gastric resection. A review of the methods of diagnosis and treatment of these conditions is made.

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ENDOMETRIAL CARCINOMA

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Endometrial carcinoma is and will continue to increase in frequency because of the increasing longevity of our population, women in particular. Because of this alone, we need to know more about this disease. Also there has been a definite pattern of therapy, superior to all other methods, evolved in the last decade. Even though a number of articles[7,10,12] have recorded this therapy trend, it is apparent from study of case histories of new patients in a tumor clinic that new therapy technics are generally unknown or have not been accepted. Moreover, old errors of management of proved or potential endometrial carcinoma cases continue to be common. To illustrate therapy trends and to call attention to errors of diagnoses and treatment, we have reviewed histories of 42 histologically proved cases that came into our University Tumor Clinic at Birmingham during the past six years.

Though the etiology of endometrial carcinoma is unknown, the clinician should bear in mind certain often observed data. This is a disease of elderly women: 75 per cent occurring after 50 years of age, 21 to 22 per cent occurring in the forties, and approximately 2 to 4 per cent occurring under 40 years of age. Dockerty et al.[3] reported 2.1 per cent of 1,694 cases under 40 years. Speert[16] reported not over 5 per cent under 40 years of age.

According to Corscaden,[2] Dockerty,[3] Speert,[14] Palmer,[9] and others, the type of woman likely to develop endometrial carcinoma is the obese, hypertensive, relatively infertile woman and one with history of either early ovarian failure or late menopause. Palmer[9] found the diabetic 10 times more likely to develop endometrial carcinoma than the nondiabetic. In our 42 cases, 23 were hypertensive, 14 obese, 13 were nulliparous, and 4 were diabetic.

The common symptom is abnormal bleeding. This occurred in 38 of 42 cases, 33 of which were postmenopausal. Watery discharge alone occurred in only 4 patients. Pain is usually a late symptom. This high incidence of abnormal bleeding is in keeping with many reports in the literature.

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The diagnosis is often masked by commonly present fibroids or polyps. Hertig[5] et al., in studying genesis, emphasizes the slow development of endometrial carcinoma from endometrial polyps to adenomatous hyperplasia, anaplasia, and then carcinoma in situ of endometrium.

The general use of intrauterine radium for bleeding from benign endometrium is being abandoned by most gynecologists, especially if surgery is not contraindicated. The reports of Smith and Bowden,[13] Speert,[15] and others warn that intrauterine radium for benign uterine disease does not lower the incidence of endometrial carcinoma. On the contrary, these reports indicate its all too frequent occurrence after irradiation. The surgeon needs to be warned of the fallacy of depending on intrauterine irradiation as a prophylactic procedure against carcinoma. As an example we present the following brief case reports:

Clinical Case Report

A 76 year old white woman, para ii-o-i, was referred from a local physician in October 1950, with biopsy specimen diagnosis of endometrial carcinoma. She gave a history of recurrent bleeding for eight years. She was 20 years postmenopausal. Previous diagnostic tests and treatment were as follows:

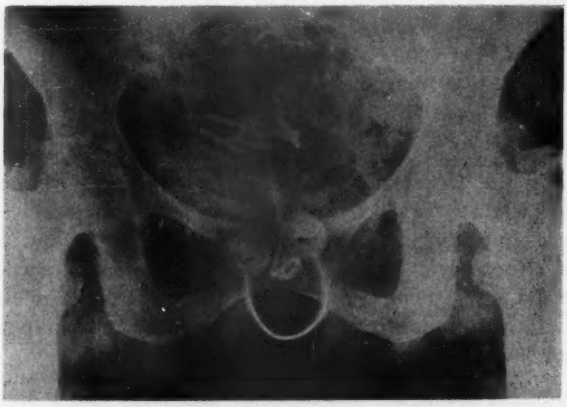

Fig. 1. Example of packing technic showing radium units (capsules each 10 mg.) in broad fundus. This gives a uniform distribution to endometrial surface, particularly to uterine horns. Note radium bombs (16 mg. each) in lateral fornices for effect on paracervical tissues and vaginal mucosae. Patient received 102 mg. x 70 hours = 7140 mg. hrs.

Eight years ago: curettage for bleeding, with a report of benign endometrium. Six years ago: curettage for bleeding, with a report of benign endometrium, but radium was applied. Two years ago: curettage for bleeding, with a report of no cancer, atrophic endometrium.

This patient illustrates Hertig's[5] contention that endometrial carcinoma cases frequently give history of previous curettage with findings of hyperplasia and polyps. It also illustrates that radium or roentgen ray treatment for postmenopausal bleeding from benign endometrium does not prevent cancer and is usually a poor choice of therapy.

The fundamental objective of treatment of carcinoma is to remove or destroy cancer cells at the initial site before extension or spread. Consequently, surgery remains most important in adequate therapy. However, because of advanced age, cardiovascular disease, obesity, and other constitutional disease, adequate surgery will be inadvisable in 30 to 40 per cent of cases when first seen. Therefore, irradiation has gradually assumed greater importance in therapy of endometrial carcinoma. It should be complemented by adequate surgery in four to eight weeks. Heyman[6] of Stockholm has revised the technic of radium application in endometrial carcinoma. He now packs the uterine cavity with small units of equal intensity to gain uniform effect on all parts of endometrial surface. He reports a relative cure rate of 61.9 per cent for irradiation alone by this packing method. This is an increase of 17.3 per cent for the packing method over the single tandem application when irradiation alone is used. No other change in therapy plan or technic has resulted in such a distinct increase in salvage. This improvement of irradiation becomes more important when it is realized that surgery alone has a limitation to its achievement. When the packing technic is used, Arneson[1] has emphasized that the salvage rate is as good for the enlarged uterus as the normal sized uterus. He emphasizes that size of uterus, degree of cell differentiation, and thoroughness of uniform irradiation (or absence of viable tumor cells in uterus removed six weeks later) are most important in prognosis.

It has become generally accepted by most gynecologists that adequate irradiation, preferably by the packing method, followed by adequate surgery in four to six weeks attains the highest salvage rate. Thus it is obvious that definite diagnosis be established before therapy is begun. Scheffey[11] et al. have ably emphasized the profit in lives salvaged by planning treatment after or at the time of definitive diagnosis. This important principle is not generally accepted by surgeons. As example, we give the following case report from our Tumor Clinic:

Clinical Case Report

A 64 year old white woman, para iv-o-iv, who had menopause at age 44, was admitted to our Clinic on Sept. 22, 1949, with a history of irregular

bleeding and foul discharge for one year. A total hysterectomy was done in a nearby city on Aug. 29, 1949. There was no curettage or biopsy. The pathologist's report was: adenocarcinoma Grade III of endometrium. No treatment was given prior to surgery. She was referred for postoperative roentgen ray treatment. The correct diagnosis by surgeon was considered preoperatively.

Fig. 2. Example of intrauterine irradiation for endometrial carcinoma showing multiple foci of unequal intensity (three 16 2/3 capsules and two 10 mg. capsules). Total of 70 mg. x 72 hours = 5040 mg. hrs.

Comment. Planned therapy with preoperative roentgen and radium would have yielded higher per cent of salvage in this type of case.

Another case illustrates the surgeon's not considering the possibility of endometrial carcinoma in light of suggestive history:

Clinical Case Report

A 54 year old white woman, para iii-o-ii, was admitted on Feb. 17, 1949. She had a history of bleeding for five months after 11 months of amenorrhea. She was obese and had a family history of cancer. Her surgeon, without curettage, biopsy specimens or cytology study, did a subtotal hysterectomy and bilateral salpingo-oophorectomy. The pathologist reported adenocarcinoma of endometrium. The patient was referred to our clinic for irradiation where cervical curettage revealed a tumor extending down the canal. Irradiation was applied. Ten months later metastasis to vaginal wall was found.

In such cases there is no opportunity for planned therapy technic. Hence the salvage rate is lowered approximately 20 per cent at the beginning of therapy. Even worse is the failure to suspect endometrial carcinoma, the use of no diagnostic procedure, and the application of incomplete surgery. Certainly the incidence of recurrence or metastasis to vaginal wall is less when preoperative irradiation to the entire uterine cavity and the vaginal roof is applied followed by adequate excision of uterus and appendages with a portion of the vaginal roof.

Though it is too early (six years) to give a salvage report, already we can project a poor report on the following basis:

Twenty of the 42 were classified on admission as advanced carcinoma or Stage III or IV. The extensive cases, of course, offer a poor prognosis. Six of this 20 had already had some therapy, usually incomplete surgery. Then constitutional advanced disease, such as cardiac patients with decompensation, hypertension with previous hemiplegia, makes planned therapy inadvisable.

The projected salvage rate of patients admitted to our Tumor Clinic is too low because of:

(1) delay on the part of the patient seeking medical care after the initial symptom,

(2) pronounced constitutional disease that compromises all or part of the planned therapy technic, and

(3) cases which are still coming in whose salvage possibilities have been reduced by the surgeons who fail to suspect carcinoma and also fail to employ definitive diagnostic tests before applying surgical procedure that is often incomplete and without transplantation safeguards.

Twenty-one of our 42 patients did not have planned therapy technic for the following reasons:

1. Nine had advanced constitutional disease.

2. Eight had inadequate surgery elsewhere and usually before positive diagnosis.

3. Three had large fibroids that made irradiation technically questionable.

4. One had pyometra resulting in incomplete therapy.

The surgical procedure of total abdominal hysterectomy with complete removal of uterine appendages and portion of vaginal roof after suture-closure of cervix and oviducts at fimbriated ends has been generally considered desirable. Recently Randall[10] et al. reported extending surgery to include lateral pelvic-wall lymphadenectomy in selected cases. They report finding carcinoma in nodes of 20 per cent of the cases so treated. This is the only change in surgical practice reported recently. It is thought that the addition of lymphadenectomy to total hysterectomy will give added survival rates particularly in the anaplastic or Grade III and Grade IV cases. Obviously only a few patients will be suitable for this extensive surgery because of advanced age, obesity, and advanced constitutional disease.

Radiation alone and repeated, if possible, in Grade IV anaplastic

endometrial carcinoma is the choice of therapy. Scheffey,[11] Miller,[7] and Arneson[1] have reported survival rates of 20, 27, and 27 per cent, respectively.

Summary

1. Forty-two cases of endometrial carcinoma seen in the University Tumor Clinic have been reviewed in light of:

(a) type of patient likely to develop the disease,

(b) common errors of diagnosis and management observed, and

(c) recent trends of treatment.

2. The advantages of preoperative irradiation, especially the packing technic of the uterus with multiple equal and small units of radium followed by adequate surgery, are stressed.

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HIATUS HERNIA

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ONLY within the past 25 years has any material progress been made in the diagnosis and treatment of hiatus hernia. Previously, the condition was seldom recognized. In 1924, Rendich[10] reported 2 cases found in 5,033 roentgenologic examinations of the gastrointestinal tract—an incidence of .04 per cent. Kirklin,[8] in 1930, reported that until 1924 only 20 cases of hiatus hernia had been listed at the Mayo Clinic, though in the following six years 90 cases were added to the group. In 1950, Brick[1] found hiatus hernias in 308, or 9 per cent, of 3,449 patients who had roentgenograms of the gastrointestinal tract for upper abdominal complaints; they observed that this incidence was second highest among disorders of the upper gastrointestinal tract, being exceeded only by that of duodenal ulcer. This general increase in incidence arises in part from the current widespread interest in the lesion by internists and surgeons; largely, however, it may be attributed to improved methods and concerted efforts by roentgenologists in arriving at the diagnosis.

Etiology. Hiatus hernia may be congenital or acquired. The vast majority are acquired, becoming evident, usually, after the fourth decade of life. In many of this group there is undoubtedly an inherent weakness of the hiatus. The simultaneous development of the diaphragm and the descent of the stomach into the peritoneal cavity in the embryo make the esophageal hiatus an ideal site for congenital weakness or malformation. If the stomach has not reached its permanent site before the left half of the diaphragm has closed, the lumbar portion of the diaphragm will not have closed properly and the hiatus will have formed about the cardia of the stomach instead of the esophagus, thus producing an enlarged, weakened hiatus.

The thoracic stomach with a congenitally short esophagus, usually considered a hiatus hernia, is essentially not a true hernia.

In view of the prevalence of hiatus hernias in individuals of middle age and older, several conditions common to patients of these ages are regarded as being directly responsible. Increased abdominal pressure, such as is produced by wearing corsets, or by pregnancy, obesity, constipation, chronic cough, and occupations which

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require strenuous exertion, is a major influence in the development and extent of the hernia. Some observers believe that the absorption of areolar tissue about the esophagus and atrophy of the elastic and fibrous tissues of the phrenicoesophageal membrane also play a significant part. In addition, Gilbert[4] described a traction type of hiatus hernia produced by a reflex shortening of the esophagus, secondary to cholecystitis. Again, in rare cases, trauma, such as is produced by a blow to the abdomen, may initiate the hernia.

Symptoms. The symptoms of hiatus hernia are varied and complex, and seldom diagnostic. They may be referable to the respiratory, the cardiovascular or the digestive system, individually or collectively. Usually, symptoms referable to the upper gastrointestinal tract predominate. Epigastric pain, heartburn, gaseous eructation and vomiting of food, especially on reclining, choking or a sense of obstruction in the lower esophagus, dyspnea after meals, palpitation of the heart, weakness and weight loss are commonly described. Anemia, also, is frequently associated. In many cases, the anemia is secondary to chronic bleeding of an ulcer or traumatic gastritis produced by friction as the stomach slides in and out of the hernial sac.[11] Some patients with anemia give a history of hematemesis or melena; others have no knowledge of bleeding.

Pressure and torsion on the heart may produce arrhythmia or palpitation, or there may be an anginal pain from pinching of the vagus nerves at the hiatus. Not infrequently, patients who have been treated for organic heart disease are found on roentgenologic examination of the gastrointestinal tract to have a hiatus hernia.[6,15] Nuzum[9] discovered a hiatus hernia in 25 of 100 patients studied roentgenographically following a diagnosis of angina pectoris.

The symptoms of hiatus hernia may be chronic or recurrent, and may vary in degree from mild to severe and shocking. As a rule, they appear insidiously and gradually become more severe, though at times the onset is sudden and acute, suggesting complete obstruction or incarceration of the abdominal contents in the hernial sac. The majority of patients have symptoms intermittently, being perfectly comfortable between episodes. Hernia of long standing, however, may produce constant and more or less acute distress. In infants with large congenital hiatus hernias the symptoms will be present from birth.

When one considers that this entity is produced by a mechanical defect in a septum between the cardiac, thoracic and peritoneal cavities, the variety of symptoms presented is easily understood. By the same token, one can easily understand why the diagnosis is often difficult. The fact that the hernia is most often observed in indi-

viduals of middle age and beyond, and thus is frequently associated with some other disorder of the digestive, cardiovascular or respiratory system, is likely to add to the confusion. Harrington[5] reported that 343 patients upon whom he had operated had had an average of three erroneous diagnoses. Thirty-four of his patients had undergone some previous operation, without relief. Other writers have described a similar experience.

Physical examination is seldom helpful in the diagnosis. Occasionally, diminished expansion, dullness, tympany and peristaltic sounds are elicited over the lower thorax.

In rare cases, esophagoscopy may be of value. Usually, the diagnosis is made by the roentgenologist. Various positions and maneuvers are necessary, and frequently, repeated examinations must be made before the hernia becomes apparent.

Treatment. The majority of hiatus hernias respond to conservative treatment, including dietary measures, antacids, antispasmodics, weight reduction, the omission of corsets and the avoidance of strenuous exercise after meals. Others, particularly the larger types and those producing obstruction, ulceration and severe anemia, or intractable pain and heartburn, require surgical repair. Also, any hernia, even though small, which shows evidence of being progressive, should be treated surgically in order to preclude increasing difficulty and an acute obstruction.

If the hernia is large, crushing of the left phrenic nerve is often advisable prior to the operation in order to relax the structures and thus facilitate the surgical performance. In poor-risk patients, crushing of the nerve is valuable as a palliative measure. Cave[2] found that phrenic nerve interruption alone gave excellent palliative results in elderly patients who were having severe pain and obstructive symptoms but were unable to withstand surgical repair of the hernia.

There is considerable difference of opinion as to whether the abdominal or thoracic approach is most advantageous in these cases. Many surgeons prefer the abdominal approach. This is probably the best route in the presence of severe obstruction or strangulation, if some other abdominal disease requiring surgery is associated, or if the diagnosis is not clear and exploration is necessary. Another large group prefers the thoracic approach. Reports indicate that the recurrence rate is lower when the latter method is used, though one runs the risk of overlooking some unsuspected abdominal disorder. In some cases, the findings at operation will necessitate a thoracoabdominal approach in order to effect a proper repair.

Numerous technics have been described for repair of hiatus hernia. Since the recurrence rate is notoriously high, efforts have been directed especially against this contingency. In large hernias, Harrington[5] overlaps the margins of the hiatus about the esophagus

Fig. 1. Anatomy and position of the esophageal hiatus.

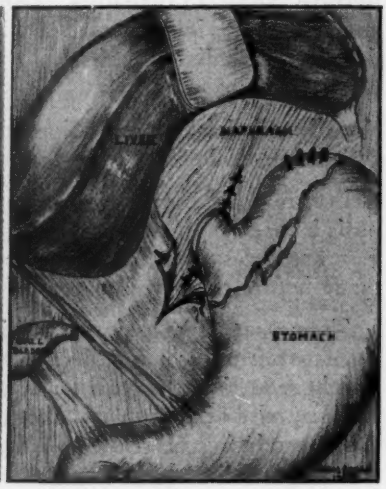

Fig. 2. Technic of repair of hiatus hernia, showing fixation of the fundus of the stomach to the under surface of the diaphragm.

and reinforces this with interwoven sutures of fascia. Eisele[6] successfully repaired a hiatus hernia with the use of cutis grafts. Merendino[7] and Rives[12] recommend displacement of the esophagus laterally into the tendinous portion of the diaphragm in order to effect a more perfect closure and prevent recurrence. This procedure is necessary in the presence of a congenitally short esophagus. Lateral displacement of the esophagus places the hiatus at the apex of the dome of the diaphragm, however, thus creating a weak spot in the most vulnerable area of the diaphragm. Moreover, lateral displacement of the esophagus into the tendinous portion of the diaphragm distorts the cardioesophageal angle and interferes with the pinch-cock action of the muscle bundles which normally form the hiatus.[14] If we recall the normal anatomy of the diaphragm, it will be noted that the esophageal hiatus is formed by two large muscle bundles arising from the crura (fig. 1). The function of these muscles is regarded as important in preventing acid regurgitation and subsequent esophagitis. We believe the hiatus is best repaired on each side of the esophagus, as recommended by Singleton.[13] This can be done without disturbing the function of the muscular ring.

In the majority of our cases, we have made the repair through the abdomen, though in a few we have found it expedient to use the thoracic approach. In order to mobilize fully the esophagus and cardiac portion of the stomach (and this is a most important feature), we first section the phrenicoesophageal membrane anteriorly and remove the hernial sac, if present. Division of the upper portion of the gastrohepatic omentum is frequently necessary to free the mesial and posterior portions of the esophagus and stomach. The esophagus and stomach having been thoroughly freed and the hiatal margins outlined, the repair is made by placing two or more sutures of silk posterior to the esophagus and the remaining sutures anterolaterally. In our more recent cases, we have attached the fundus of the stomach to the under surface of the diaphragm laterally with four or five small silk sutures (fig. 2). Fixation of the fundus to the diaphragm in this manner minimizes the danger of having the stomach slide back into the hiatus.

Conclusions

1. The finding of hiatus hernias in patients with symptoms cannot be dismissed as inconsequential.

2. The urgent problem before the surgeon is the development of a technic which will insure the lowest rate of recurrence.

3. Technically, the operation may be easier when performed through the chest. The thoracic approach should always be employed in operations for recurrences.

4. We consider observation of the following basic surgical principles essential to the success of the repair:

(a) crushing of the phrenic nerve in all large hernias;

(b) removal of the sac and complete mobilization of the lower esophagus and fundus of the stomach;

(c) repair of the hiatal defect on both sides of the esophagus with nonabsorbable sutures; and

(d) as a further precaution against recurrence, fixation of the fundus of the stomach to the under surface of the diaphragm, as illustrated.

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TOXEMIA OF PREGNANCY

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TOXEMIA of pregnancy is a metabolic disorder characterized by vascular ischemia, which may be general or localized. In this latter respect, it resembles the protean nature of syphilis or of arteriosclerosis. It is furthermore characterized by sodium chloride retention with resulting edema leading to cellular necrosis if localized to some of the parenchymatous organs, such as the liver, kidneys, adrenals and placenta. The effects upon the brain lead to convulsions, which are characteristic of the more severe form, eclampsia.

There are several types of the disorder: simple toxemia, toxemia developing upon hypertensive cardiovascular arteriosclerotic basis, toxemia superimposed upon a nephritic or diabetic condition, and others.

One of the difficulties in the past and even present study of the disease is the inability to differentiate, at the time, the various types of the disorder, especially true toxemia from that superimposed upon hypertensive vascular disease and nephritis.

It seems, now, that the great majority are those complicating hypertensive disease, which is prone to its development. In the past, this differentiation depended upon the history of previous hypertension with diastolic pressure of 90 to 100, or above, and upon the behavior of the pressure in subsequent years of the patient's life, or the presence of evidence of chronic nephritis. Many studies are being devoted to various specific tests for identification of the true type at the time of the attack. Often, the onset of toxemia is the first appearance of hypertensive disease, which then continues.

Chesley[1] is of the opinion that he may differentiate these various types by urea and uric acid clearance tests since both clearances are normal in uncomplicated hypertensive disease and both are low in renal disease, while in preeclampsia, the uric acid clearance is disproportionately depressed.

For the past six years, Dieckmann[2] has been experimenting with the excretion and retention of the sodium ion in patients with evidence of toxemia. Working with accurate beam scales and a constant temperature humidity room, the administration of doses of 25 Gm. of sodium salts have been meticulously studied in many

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patients. Some of the facts found are as follows: He has concluded that the intravenous administration of 1,000 ml. of 2.5 per cent sodium chloride is safe in all cases, unless there is impending pulmonary edema. In general, an increase in weight gain (water retention) was associated with the sodium chloride solutions given during the ante partum period. In the puerperium, patients with ante partum edema almost invariably have excessive excretion of water and weight loss. The sodium chloride injections may retard this loss, but could not cause the same retention as in the ante partum patient. Forty per cent of the patients showed increase in edema. In the ante partum stage, most of the patients had some increase in blood pressure with the injections. A considerable number of those with normal blood pressure (less than 140-90) had a decrease. The blood pressure changes were quite similar before and after labor.

The sodium chloride injections were associated with increase in proteinuria in the majority of cases. An interesting fact was that these results were not so impressive if the sodium was in the form of other salts than chloride. Dieckmann states: "Some will show systemic responses such as blood pressure elevation and symptoms of increased intracranial pressure with relatively small retentions of sodium and water; while others may have tremendous gains in weight associated with marked retention of sodium chloride and water and yet show no pitting edema or clinical evidence of it. This difference in response is what we are now studying, for it seems that if we can determine the reason for the response in one patient or the failure of response in the other, we may have the cause of preeclampsia."

The sodium chloride injections may be of value in differentiating true toxemia from that of the cardiovascular hypertensive patient in that the latter excrete almost immediately most of the sodium chloride and without retention.

There is a group at Mount Sinai and Presbyterian Hospitals in Chicago[3] studying the problem with the use of the Krasno-Ivy flicker photometer, the flicker fusion test. By this test, they have been able, almost invariably, to differentiate those patients who may develop toxemia, or later hypertension, from normal patients.

Many authorities make use of eye ground studies, attempts to differentiate those patients in whom toxemia may develop, as well as to diagnose chronic nephritis and essential hypertension. Agreement among observers is difficult as to classification and interpretation of the findings. One of the most recent papers on the subject is that of Bartholomew[4] and his associates who reported on observations of 1,000 pregnancies. They conclude that it is possible to

predict in 90 per cent of normotensive cases by retinal examination early in pregnancy whether or not hypertension may develop late in pregnancy.

A most interesting and intriguing hypothesis for the cause of toxemia of pregnancy has recently been further elaborated by Bastiaanse and Mastboom.[5] This is the theory of ischemia of the gravid uterus, a sort of physiologic Goldblatt clamp applied to the uterine, rather than the kidney vessels. This hypothesis might explain the predisposing influence of primiparity, multiple pregnancies and hydramnios, hydatidiform mole, the increase in toxemia as pregnancy progresses, the occurrence of toxemia in the cardiovascular hypertensive, or the nephritic patient. It may also quite adequately explain the development of abruptio placenta, placental infarcts and possible degenerative toxic products which, freed in the blood stream, may have deleterious effects upon the liver, kidneys and brain. The theory does not as well explain puerperal eclampsia, which may comprise 20 per cent of cases.

Further, in regard to the etiology, the disorder is more common in young primiparas, but is more fatal in the older multiparas, probably due to the superimposition upon degenerative changes of age. In a study of our cases of eclampsia as to seasonal incidence or as to the local slate of the weather, no correlation could be determined. True toxemia is less common than the type superimposed upon an already existing, or latent, hypertensive complex. This may be one reason for increase in the true incidence in the Negro population.

Winslow Tompkins[6] and others have produced evidence that nutrition, especially protein and vitamin absorption, is significant in the protection against the disorder. Toxemia most certainly is tied up with adrenal cortical hormone in control of salt retention and with the pituitary antidiuretic hormone and the appreciation of these hormones will, no doubt, improve as further studies are made.

It always seemed to me that eclampsia formerly had a high incidence in the southeastern portion of the United States, possibly because of lack of refrigeration and dependence upon pork by so many of the lower income group as the main protein diet, and this in the form of salted meat. The bulk of the diet is made up of high carbohydrates in the form of grits, corn bread, syrup and sweet potatoes, plus greens of various types, and salt pork which contains more fat than protein and more salt than necessary. The increase in cattle raising, dairying and artificial refrigeration has been associated with lowering of the incidence of eclampsia in this part of the country. The association may, however, be only incidental.

Regardless of the etiologic factors, the management of the pregnant woman subject to toxemia is of most practical importance to the clinician. The following outline is mainly empiric, based upon impressions received in the care of 100 or more eclamptic and many hundred preeclamptic patients. Statistical studies have not proved too valuable because of lack of basic uniform classifications, and because of the extreme variation in manifestation of symptoms and findings and degree of disorder. There is even great disagreement among researchers as to the blood pressure, what is normal and what is abnormal. Throughout any pregnancy, one of the chief objects of the attendant is to prevent the onset of toxemic symptoms, and it is my opinion that this goal may be obtained in almost 100 per cent of pregnancies. By what means can this be done? The following regime has been found to be effective. One most have the full cooperation of the patient. This is obtained by carefully explaining the nature of the problem. The management is almost entirely one of nutrition, essentially high protein, low carbohydrate, low fat and low salt diet.

Restriction of salt may not be necessary in cases of essential hypertensives according to Dieckmann's studies, but it has been found difficult to identify surely those individuals, and, therefore, no salt should be added at any time to the food eaten by those whose weight gain is above normal. The patient is urged to eat lean meat and eggs without additional salt, and her weight gain, which should be no more than ½ pound per week according to Dieckmann, made up by additional calories from carbohydrates and fats. If her weight is excessive to begin with, I believe it is well to reduce still the gain. Some patients, above 170 pounds at onset, have done well weighing 10 pounds less at time of delivery. Some who are underweight at the beginning of pregnancy may be allowed more gain, but the proteins should be obtained first. Tompkins has shown that underweight patients who fail to gain in the first months of pregnancy are likely to deliver prematurely.

It is probably well to give supplementary iron in the form of ferrous sulfate and vitamins to all patients although a high protein diet supplies much of these items. With toxemia thus controlled in the normal patient, as well as in the hypertensive, albumin will rarely appear in the urine, unless there is chronic nephritis. In some of these latter patients, it may not be possible to carry pregnancy to term, especially if blood chemistry changes occur. In these cases, the fetus often dies and is spontaneously expelled, or, upon medical consultation, it may rarely be necessary to terminate pregnancy. In the others, labor should be allowed to take place at term and procede spontaneously, unless there is marked feto-pelvic disproportion. For

the sake of the fetus, labor should not intervene before the thirty-fourth week, inasmuch as the chief danger to the normal fetus in toxemia of pregnancy is prematurity. The facts to determine at each of the regular antenatal visits are, in order of importance: (1) weight gain, including any signs of edema, as tightness of finger rings or ankle swelling; (2) blood pressure; and (3) urinary changes, chief of which is proteinuria.

Toxemia of pregnancy may be compared with cardiac decompensation in the pregnant cardiac patient. It is possible that one cannot prevent the attack in certain instances, but these are extremely rare. Acute observation on the part of the attendant will detect the earliest signs in each case and correction at this stage is relatively simple. If the signs go undetected day by day, the restitution becomes more difficult. In almost every case, toxemia of pregnancy has progressed unrecognized for longer than wise observation would permit and many of these eventuate into eclamptic attacks in which the mortality rate is tremendously augmented.

In regard to the causes of death in eclampsia, Way[7] of the Department of Pathology, Duke University School of Medicine, correlated the clinical findings with the pathologic study of the tissues in 33 fatal cases, all but 8 of whom had convulsions. The almost universal pathology consisted of a focal necrosis of the liver; the more acute, the less inflammatory reaction. Absence of scars in the liver in those who had had previous attacks drew the conclusion that the changes in the liver associated with eclampsia were reversible. All of the cases had varying degrees of kidney changes, mainly those of arteriolonecrosis. Thirty-three per cent revealed various degrees of necrosis and hemorrhage of the adrenal glands. Where this was extensive to complete destruction of the cortex, these patients usually died in terminal shock. In half of the cases, the lungs showed evidence of pneumonia in varying degrees and these were usually associated with pulmonary edema. Several had, in addition, bilateral hydrothorax. Some had pulmonary edema without pneumonia. Three fourths of all the patients had one or both, pneumonia or pulmonary edema. The heart muscle was damaged by necrosis in 4 cases and by hemorrhage in 12 cases. Two patients died of massive brain hemorrhage.

The management of the eclamptic attack then must take into consideration the possibility of development of one or more of the foregoing list of tissues damaged and a rational routine followed which attempts to prevent their occurrence, since the chief defect leading to visceral damage is a generalized vasoconstriction, with resulting hypertension "which leads to small arterial or arteriolar changes;

these vascular changes, together with local tissue hypoxia, result in the petechial hemorrhages and the focal necrosis."

Without specific therapy, one must use empiric methods.

The treatment developed aims at combatting all of the deleterious effects noted: (a) cessation of the convulsive seizures; (b) promotion of oxygenation; (c) prevention of additional damage to any organ; (d) elimination of the toxins and salt; (e) reduction of hypertension; (f) promotion of rest; (g) surgical shock therapy when indicated.

Routinely, the management used is as follows: as soon as the diagnosis is confirmed (blood pressure, urinary contents, and so on, ascertained) magnesium sulphate, 20 cc. of a 10 per cent solution, is administered intravenously slowly and with knowledge that toxic symptoms may be manifested. If the patient is conscious during intravenous administration of the magnesium sulphate solution, she usually says that she feels hot. Sterile solution of calcium gluconate may be kept available to counteract severe forms of magnesium sulphate intoxications. If the patient is not in coma, she may be given by mouth 1½ ounces of magnesium sulphate in addition to the intravenous administration. Usually the magnesium sulphate reduces the blood pressure to 160 systolic, or lower, and the convulsions cease. The magnesium sulphate may be repeated intravenously every hour as long as the systolic blood pressure is 160 or more. Although seldom required, 20 Gm. in 24 hours may be given thus.

One must remember that repeatedly recurring convulsions may not be due to the same cause as the first one, but may stem from an obstructed airway and consequent hypoxemia or development of acidosis because of increased retention of carbon dioxide, either or both of which may initiate convulsions. These cause more asphyxia and institute a vicious cycle which, unless broken, ends in heart failure, acute pulmonary edema and death; this being by far the most common cause of death in eclampsia. Royston has already stated a similar view. Thus a mistake in these conditions often leads to further depression due to the additional drugs used, such as morphine, barbiturates, paraldehyde, and others, so at all times the patient must have adequate oxygenation which is best indicated by lack of cyanosis of the finger tips. Convulsions, of course, are the most productive of oxygen obstruction and every effort must be directed to their control. If it is certain that they continue because of the original toxic irritation of the brain and not from the results of anoxia, it has been found that the barbiturates are as non-toxic as any other and may be given intravenously as sodium pentobarbital. The method of administration is very important. No stated dosage

is to be relied upon because some patients are more susceptible to its action than others. The drug is highly diluted in sterile distilled water and given intravenously slowly over a long period of time, enough only to control the convulsive seizures. This may require 2 grains or possibly up to 7 or more grains. We believe morphine is contraindicated in eclampsia; for it is said to increase the introcranial pressure and may depress the maternal respiratory rate, thereby increasing the anoxemia to the mother and subsequently the fetus.

Next to asphyxial deaths infection is the most common factor. Therefore, all avenues to infection should be blocked, especially respiratory and birth canal. Prophylactic antibiotics may be used. Any patient in convulsions or coma is liable to aspiration of regurgitated stomach contents. To prevent this is the object of therapy next to cessation of the convulsions. The posture of the patient, upon her side or with her head low, has many advantages. The chief disadvantage is that it tends to increase brain edema which can possibly prove fatal. However, those patients in whom edema of the face and neck occur may be treated in coma by constant stomach suction with a Wangensteen tube; of course, nothing is given by mouth during coma which may continue for several days. Parenteral fluids are therefore necessary and are easiest and best administered intravenously. Probably the best circulatory support is dextrose solution and, as in all other toxemias, enough fluid in the vessels to promote adequate circulation has proved by experience to be indicated. Consequently, even if there is peripheral edema, the full daily requirement of fluid with dextrose is administered. This, if the patient is in coma, is at least 3,000 cc. of 5 per cent dextrose in sterile distilled water daily, given slowly intravenously. The only contraindications to intravenous fluids are cardiac decompensation and impending pulmonary edema. Thiamine, niacine and other vitamins may be added advantageously. Every woman in labor should have 11 Gm. hemoglobin; if less, a transfusion is indicated unless there is cardiac decompensation. The absence of sodium chloride prevents further edema and at the same time reduces that already present. Furthermore, the heart is nourished and stimulated; the blood flow to the vital organs is increased, resulting in better function. Anuria is much less common and acidosis is combatted. The uterus and fetus are likewise nourished and toxins, if present, may be diluted and eliminated. Ware and Noblin,[8] as well as Rucker,[9] recommend digitalization of eclamptic patients in order to prevent right heart failure and pulmonary edema. Reinberger and Russell[10] use atropine in edema of the lungs rather than prevention by digitalis. Bryant and Fleming[11] and many others subsequently have had excellent results

in controlling convulsions with veratrum and others have used spinal or caudal anesthesia. If these methods are used indiscriminately, there is some danger of lowering the pressure into a state of shock.

No salt is allowed because the sodium ion, together with hypoproteinemia of pregnancy, leads to increased water retention. Strauss,[12] DeSnoo[13] and Davis[14] all are in favor of limiting sodium chloride in toxemias of pregnancy. Adequate salt-free diet with iron and vitamins is recommended. Restriction to milk is not advised because of milk's high salt content. As in any acutely ill patient, rest is essential and should be the prime consideration of good nursing care. In a darkened and quiet room the patient should be subjected to as little manipulation and, during a convulsion, to as little restraint as possible to prevent injury. A wooden mouth gag should be handy to avoid tongue biting. To obviate aspiration of stomach contents when the patient is in coma, the foot of the bed may be elevated or the patient kept on her side, and we often gently insert a nasal suction tube into the stomach for continuous aspiration.

To counteract anoxemia, oxygen should be administered for the mother's as well as for the fetus' welfare. If there is anemia, repeated blood transfusions are indicated. If the patient is one of the two thirds or more who have the attack prior to delivery, her condition is allowed to improve or become stationary. She is then subjected to induction of labor accomplished, as a rule, by rupture of the membranes. If she is a primipara it is well to have a previous roentgenologic study of her pelvic inlet before labor induction.

Summary

A five-point treatment in eclampsia is outlined:

1. Two Gm of magnesium sulfate intravenously in sterile 10 per cent solution to be followed by 1 Gm. every hour as long as the systolic blood pressure is 160 or more. Twenty Gm. in 24 hours may be necessary. Convulsions must be stopped, preferably by barbiturate (sodium pentobarbital or sodium phenobarbital) sterile dilute solution administered slowly intravenously only until the convulsions are under control. One must be sure of a patent airway.

2. Adequate salt-free diet with full requirement of fluid. Three thousand cc. daily of 5 per cent dextrose in sterile distilled water intravenously is substituted when the patient is in coma and there is no evidence of pulmonary edema.

3. Oxygen is administered constantly and blood transfusions used when indicated.

4. Physiologic rest is required with hourly turning to prevent

blood stasis in the vital organs. Studied attention to prevent aspiration of stomach contents includes head-low position or constant suction with a stomach tube.

5. When the condition improves or becomes stationary, induction of labor by sterile rupture of the fetal membranes may, on consultation, be indicated.

In conclusion, a plea is made for a national toxemia committee to correlate basic research in the United States and to parcel out different problems in the puzzle to various clinics for attempts at solution. In this manner much of the expensive and often unscientific studies could be avoided.

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PREVENTION OF CARDIAC ARREST

The prevention of cardiac arrest has not received from physicians in general and surgeons in particular the attention its importance would seem to warrant. It certainly has not aroused the interest in prevention which is displayed in the management of this sudden emergency. In part at least this is due to the fact that full exploitation of the possibilities of prevention in any condition usually appears to follow a rather long experience and all too often an inadequate method for successfully handling the actual disturbance.

When one is faced with an emergency such as cardiac arrest, action to rectify the situation is so essential that reflection as to its cause seems singularly inappropriate. In addition, the pressure of other duties, its infrequent occurrence, its mysterious appearance, all combine to focus attention on methods of resuscitation to the exclusion of the possibility of prevention.

The famous saying of Wilfred Trotter's that "new ideas are the most powerful and rapidly acting antigens known to science" might, for our purposes, be made to include old ideas which are good but not popular. The inexplicable lack of understanding or even curios-

ity as to its causal genesis, the mechanism of its development, or indeed that a simple, safe and sound therapeutic agent for its prevention, was and is always available, constitutes for surgeons a most impressive and inescapable challenge.

Sudden cardiac arrest is nearly always preventable by atropine. Certainly this is true in those cases in which surgical intervention has produced a successful clinical result.

An analysis of over 1,100 cases of cardiac arrest by one of us from an usually wide geographical distribution has brought out many interesting facts and some that were quite unexpected. For example, 20 per cent of all cases occurred in the group under 10 years of age. Following this, there is an abrupt decline until one comes to the group over 40 years of age. In children, it is most important to remember that they have highly sensitive reflexes. This is pointedly demonstrated by the response of the sinus node to respiration and its influence upon cardiac rhythm and the reflexes are more readily evoked as a result. With increasing age this sensitivity gradually decreases and at the same time the incidence of cardiac arrest lessens.

In the older age group, the explanation might well be age period changes in the vascular tree, lesions in the specific tissue, either or both rendering the heart increasingly vulnerable to vagal stimulation. The ventricular specific tissue is more depressed under these conditions in originating stimulus formation under the influence of anesthetic agents. At such times an undesirable reflex is not so likely or readily set up; nevertheless, when it does occur, it is more serious and more obvious than is the case in the younger age periods, where more reactive ventricular specific tissue is present.

In summary one can say that cardiac arrest is a surgical emergency in which time is of the essence. Action is imperative. However, regardless of how successful or spectacular the most ingenious and technically perfect surgical procedures have been or may be, surely it must be a sobering thought to realize *that particular emergency was preventable* and preventable by such an old safe and reliable therapeutic agent as *atropine,* the very simplicity of which has contributed to its surprising and inexcusable neglect.

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BOOK REVIEWS

The Editors of THE AMERICAN SURGEON *will at all times welcome new books in the field of surgery and will acknowledge their receipt in these pages. The Editors do not, however, agree to review all books that have been submitted without solicitation.*

RUPTURES OF THE ROTATOR CUFF. By H. F. MOSELEY, M.A., D.M., M. CH. (Oxon.), F.R.C.S. (Eng. & C.), F.A.C.S., Hunterian Professor, Royal College of Surgeons of England; Assistant Professor of Surgery, McGill University; Associate Surgeon, Royal Victoria Hospital, Montreal, Quebec, Canada. Springfield, Charles C Thomas, 1952. Cloth binding, 90 pages. Illus.

The author of this very fine treatise is to be commended. He has very forcefully and clearly substantiated many of the findings of Codman, the pioneer in this phase of orthopedics.

The chapters devoted to the anatomy and function of the rotator cuff are indeed informative. Attention is duly directed to the clinical picture in the acute tear of the rotator cuff and differentiated from the late tear. Operative repair in the acute stage gives in most instances excellent results; whereas, in the late cases, the results of surgical repair are not as satisfactory.

All of the illustrations and plates are unusually good. This is particularly true of those related to the repair of acute and chronic ruptures.

There is a good index.

This reviewer unequivocably recommends this book to all interested in this subject.

WOOD W. LOVELL, M.D.

FRACTURES AND JOINT INJURIES. By SIR REGINALD WATSON-JONES, B.Sc., M.Ch.Orth., F.R.C.S., F.R.A.C.S. (Hon). Orthopedic Surgeon to His Majesty the King; Director of Orthopedic and Accident Service, The London Hospital; Senior Surgeon to the Robert Jones and Agnes Hunt Orthopedic Hospital; Civilian Consultant in Orthopedic Surgery to the Royal Air Force. President of the British Orthopedic Association; British Editor of the Journal of Bone and Joint Surgery; Member of Council of the Royal College of Surgeons of England; Chairman of the Joint Committee of Management, Institute of Basic Sciences of the University of London and the Royal College of Surgeons of England; Chairman of Medical Committee of the National Advisory Council for Resettlement of the Disabled; Chairman of the Joint Committee for Postgraduate Orthopedic Education. Baltimore, The Williams and Wilkins Company, 1952. Volume I, Fourth Edition. 443 pages with illustrations plus index of authors and subject index.

This text has been improved by its author immeasurably. Several hundred new illustrations have been added and new chapters presented on wound-shock and the adaptation syndrome in relation to shock; on the treatment of open fractures and joint wounds, chemotherapeutic control of infection, early closure of wounds by secondary suture or skin grafting, and plastic surgery in fracture treatment; on transplantation of bone, cancellous bone grafting and intramedullary nailing; and on fatigue fractures and pathological fractures.

One of the best chapters is that dealing with avascular necrosis of bone. It is clearly written and well illustrated.

The author again emphatically states the importance of prolonged and adequate immobilization of fractures. In the chapter devoted to the reactions of bone to metal, he disagrees strongly with those who advocate the use of compression forces, slotted-plates, leg screws and early ambulation to promote the union of fractures.

The last chapter of Volume I is concerned with pathological fractures. This is indeed a most interesting section and the illustrations are extremely good. The color photographs are superior, the radiographs and prints clear and illustrative.

Although there are many who will dissent with some of the statements in this book, this reviewer feels that it represents the best of all English textbooks and as such should readily be acceptable by all interested in fractures, students and physicians alike.

WOOD W. LOVELL, M.D.

Books received are acknowledged in this section, and such acknowledgment must be regarded as a sufficient return for the courtesy of the sender. Selections will be made for review in the interests of our readers and as space permits.

THE KNEE AND RELATED STRUCTURES. By PHILIP LEWIN, M.D., F.A.C.S., F.I.C.S., Professor and Chairman of Department of Bone and Joint Surgery, Northwestern University Medical School; Attending Orthopedic Surgeon, Cook County Hospital; Senior Attending Orthopedic Surgeon, Michael Reese Hospital; Professor of Orthopedic Surgery, Cook County Graduate School of Medicine, Chicago; formerly Colonel, Medical Corps, A. U. S. Philadelphia, Lea & Febiger, 1952. $16.00.

THE ENGLISH PIONEERS OF ANAESTHESIA. By F. F. CARTWRIGHT (Beddoes, Davy and Hickman) Bristol: John Wright & Sons Ltd.; London: Simpkin Marshall Ltd.; Baltimore, Md., The Williams & Wilkins Company, 1952. $4.50.

AMBULATORY PROCTOLOGY, Second Edition, Revised. By ALFRED J. CANTOR, M.D., Proctologist, Kew Gardens General Hospital, Long Island, New York; formerly Assistant Attending Gastroenterologist, Queens General Hospital, and Assistant Adjunct Proctologist, Hospital for Joint Diseases, New York: with a foreword by BEAUMONT S. CORNELL, M.D., Editor, American Journal of Digestive Diseases. Paul B. Hoeber, Inc. $10.00.

ABSTRACTS FROM CURRENT LITERATURE

TEN YEAR SURGICAL RESULTS IN RECTAL CANCER. George E. Binkley, Maus W. Stearns, Jr. *Surgery, Gynecology and Obstetrics 93*:428-430. (Oct.) 1951.

In this report the authors have studied 211 patients who underwent some type of surgical extirpation of the terminal large bowel for cancer over 10 years ago. The lesions were located either in the rectum, rectosigmoid or lower sigmoid colon. The over-all mortality in the 211 cases was 13.2 per cent. This high operative mortality of 10 to 30 years ago has been lowered. At present, the authors feel that the operative mortality plays a much less important role than it did in the years under review. Their operative mortality for example, in the year 1948 was .9 per cent.

Out of 183 patients who survived the operation, 10 were lost to follow-up within a 10 year period all being free of disease at the time of their last check-up. Twenty deaths resulted from causes other than cancer in patients who were also free of evidence of recurrence when last examined. One hundred and fifty-six cases remained upon which the determinate figures are taken. Of these 79, or 50.5 per cent survived five years or more while 60, or 38.4 per cent, lived 10 years or more.

There is some influence of the type of operation upon the final results as illustrated in the following figures: Of the patients who had perineal resections, only 42.6 per cent survived for five years while 58.8 per cent of those who had abdominoperineal resections survived for that length of time. Abdominoperineal resection also gave better results on the basis of 10 year survival. Only 30.8 per cent of those with perineal excisions survived for 10 years as compared with 50 per cent of those who had the more radical procedure.

From this study it was quite evident that patients who were operated upon before regional lymph nodes were invaded had a much better prognosis than did their more unfortunate comrades. Of the 108 patients without node involvement, 64, or 59.2 per cent, survived 5 years, and 48, or 43.5 per cent, survived 10 years or more. Of the 38 patients with regional lymph node involvement, 10, or 26.4 per cent, not only survived five years but also survived the 10 year period. It is worthy to note that 4 patients with node metastasis at the time of operation, survived 10 years without recognizable disease only to die of metastatic cancer between the eleventh and thirteenth postoperative years. Three patients with node metastasis died of their disease after 10 years.

The authors have concluded that the results of abdominoperineal resection in one stage is superior to those following more conservative procedures; that early recognition and treatment of the disease before the regional lymph nodes have become involved offers the best chance of cure; and that approximately one third of those who are free of disease for five years, but in whom metastatic cancer is subsequently found, are shown to develop recurrence within the pelvis.

R. H. S.